GENERAL MILLS, INC.
Mechanical Division
2003 E. Hennepin Avenue
Minneapolis 13, Minnesota

PROJECT SKYHOOK

by

R. F. Mautner and C. P. Merrell

FINAL REPORT
Projects 85022 and 85023
1 September 1953 to 31 July 1954
Contract No. Nonr 875(00) Annex X.

Submitted to
Office of Naval Research
Washington 25, D. C.

Submitted by: J. R. Smith
J. R. Smith

Approved by: J. E. Barkley
J. E. Barkley
Head, Chemistry and Physics Research

Report No. 1434
Date: 19 July 1955
Project: 85022 and 85023

I. AIMS

On May 22, 1953, Contract Nonr 875(00) between GMI and the Office of Naval Research was amended to provide for the launching of "Skyhook" plastic balloons to carry scientific instruments to high altitudes. Scientific payloads were supplied by the Physics Departments of various universities also under contract to the Office of Naval Research. General Mills supplied "Skyhook" balloons, balloon controls and safety equipment. Engineering services for launching and altitude information were also supplied by General Mills technical personnel.

II. WORK ACCOMPLISHED

Flight work on this project was carried out from September, 1953 through July, 1954. Twenty-one flights were made in this period: Flights 1058, 1059, 1071 through 1083, 1135, 1152, 1153, 1154, 1181, and 1211. In addition, flight service consisted of obtaining International Civil Aviation Operation clearance, gas metering and inflation, and launching assistance. Tracking and recovery was provided for three flights flown during the field trip to Saskatoon, Saskatchewan, Canada. Another field trip made on this project was to the vicinity of the Galapagos Islands on the geomagnetic equator. Remaining for further work and constructed under this contract were four 85' balloons and two 128' Tapeless Tailored balloons (one ducted and one non-ducted).

A summary of flight data follows.

Flight No.	Scientific Group	Balloon	Para-chutes	Altitude Control	Telemeter	Load Release
1058	U. of Wash. J. J. Lord	733	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1059	U. of Minn.	85	28'	None	Supplied by U. of Minn. (Olland cycle)	Dual Timers
1071	NYU and U. of Minn Neuberg, Anderson	851E	24'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1072	NRL-Stiller	85	24'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1073	U. of M. Anderson	85	24'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1074	U. of M. Danielson	85	24'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1075	Bartol McClure	85	24'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1076	NYU Neuberg	WRI73	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1077	U. of Chicago U. of Wash. Schein-Lord	WRI73	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1078	NYU Neuberg	WRI73	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1079	NRL Stiller	85	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers

Flight No.	Scientific Group	Balloon	Para-chutes	Altitude Control	Telemeter	Load Release
1080	Bartol McClure	85	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1081	U. of M. Danielson	85	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1082	U. of M. Anderson	85	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1083	U. of M. Schein	85	28'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1135	U. of Chicago M. Schein U. of Iowa M. Gottlieb	1161	30'	Constant level steel-shot 93,000'	2 mc Dual Bellows Drum Type Code-sonde	Radio Command & Dual Timers
1152	U. of Minn. E. P. Ney	1161	24'	Supplied by U. of Minn. (Follow-up)	Supplied by U. of Minn. (Olland cycle)	Dual Timers
1153	ONR Hitch-hike	85	2-12'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1154	U. of Minn. E. P. Ney	131TT	24'	Supplied by U. of Minn.	Supplied by U. of Minn.	Dual Timers
1181	ONR Hitch-hike	791	2-12'	None	2 mc Dual Bellows Drum Type Code-sonde	Dual Timers
1211	U. of Chicago M. Schein U. of Iowa M. Gottlieb	128TT	30'	Follow-up con-trol, steel shot	2 mc Dual Bellows Drum Type Code-sonde	Radio Command & Dual Timers

III. SUCCESS

All 1.5, 2, and 2.5 balloons flown were successful. Their average rates of rise ranged from 616 to 992 fpm and their floating altitude varied from 84,000 to 98,300 ft.

Three of the four 1 mil balloons failed. One Winzen 73' balloon failed from apparent cold brittleness fracture (see T-A #A-21194-A) and was not recovered, having landed 4.5 miles inland on a very rugged island of volcanic rock. Two GMI 85' balloons failed from apparent atmospheric turbulence (see TA's #A-21229-A and A-21202-B). One GMI 85' 1 mil balloon made a successful flight for NRL (Flight #1082). In all flights the cold brittleness temperature was exceeded by a minimum of 16°C. with the exception of Flight 1082 which failed at 42,000 ft. at -58°C.

Flight 1058 leaked gas and floated slowly down from approximately 60,000 feet and was lost by the tracking plane and truck as the winds at 200 to 300 mb level carried it faster than its ability to follow. It is estimated to be lost in the vicinity of Peoria, Illinois.

Flight 1059 burst on night ascent for the probable reason of atmospheric turbulence. The instruments were recovered, although the prenature drop was at night.

Flights 107[illegible] through 1083 were accomplished with a variety of balloons. This was due to the extreme urgency of the contract, which allowed insufficient lead time for obtaining materials. Use was made, therefore, of balloons on hand, balloons available from Winzen Research, and balloon materials presently in the plant on other contracts.

Flight 1181's timers did not function and therefore the load did not

release. Recovery was reported in the vicinity of Ogaki, Ontario, although tracking ceased on the second day in western South Dakota. As yet, the flight equipment has not been received at GMI's laboratory.

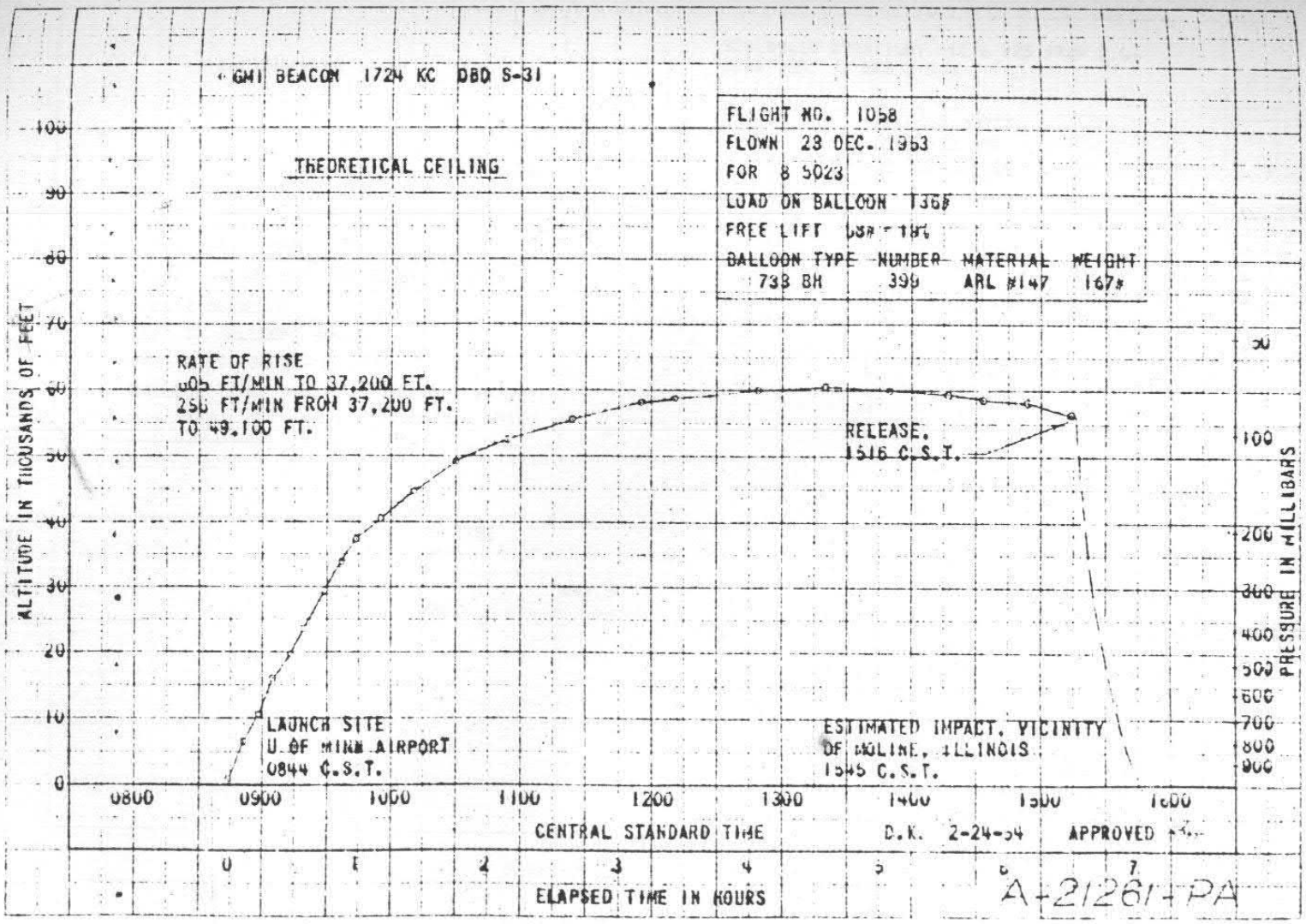
Flights 1152, 1153, and 1154 were launched from Saskatoon, Saskatchewan. The first flight performed very successfully, although the balloon leveled off low due to air being accepted at approximately 90,000 feet. The second and third were failures due to holes in the balloon. Although the hole was discovered in the third balloon before launching and was patched, the patch apparently did not hold because of a concentration of stress at the point of application of the patch and the balloon descended after reaching 78,000 feet. The remaining two flights, 1135 and 1211, were flown with practically identical loads and are of great interest for comparison of non-ballasted balloon performance at sundown of "air stabilized" versus "ducted appendix" design. It is interesting to note that at this altitude, the stratosphere (much more stable) contributes greatly to the ducted balloon's stability after sunset. It is reasonable to assume, therefore, that all future work done at 10 mb or less pressure-altitude would benefit in altitude and stability by utilization of one of several methods of "check valve" appendix design. Both performed successfully, although each was accompanied by ballasting instrument failure and the total ballast was consumed before sunset on each flight.

Flight data from all flights are presented in the following section, Appendix A.

General Mills, Inc. is happy to have been able to work with the personnel of the Office of Naval Research in carrying out these high altitude scientific experiments.

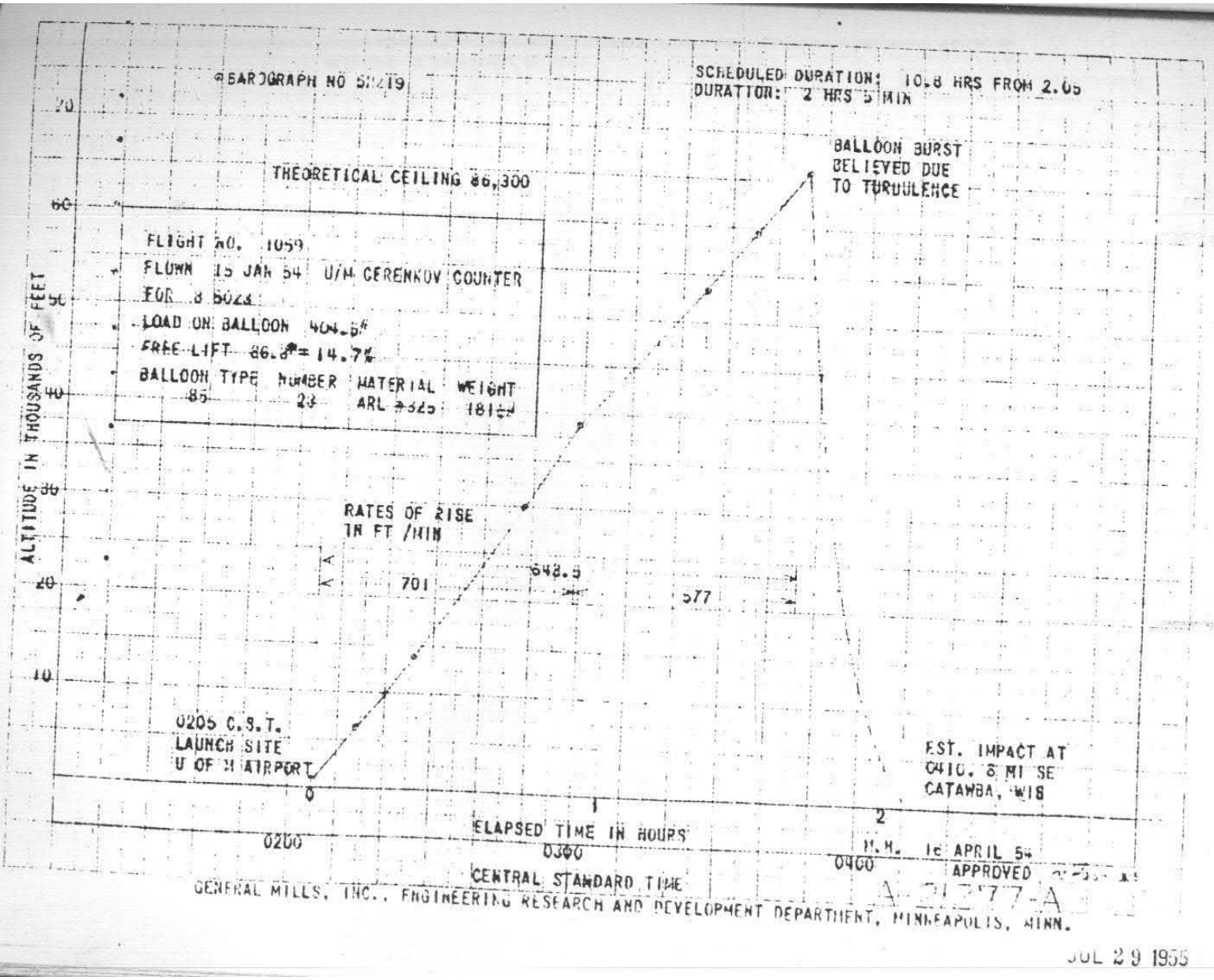
FLIGHT DATA

APPENDIX "A"



A-21261-PA

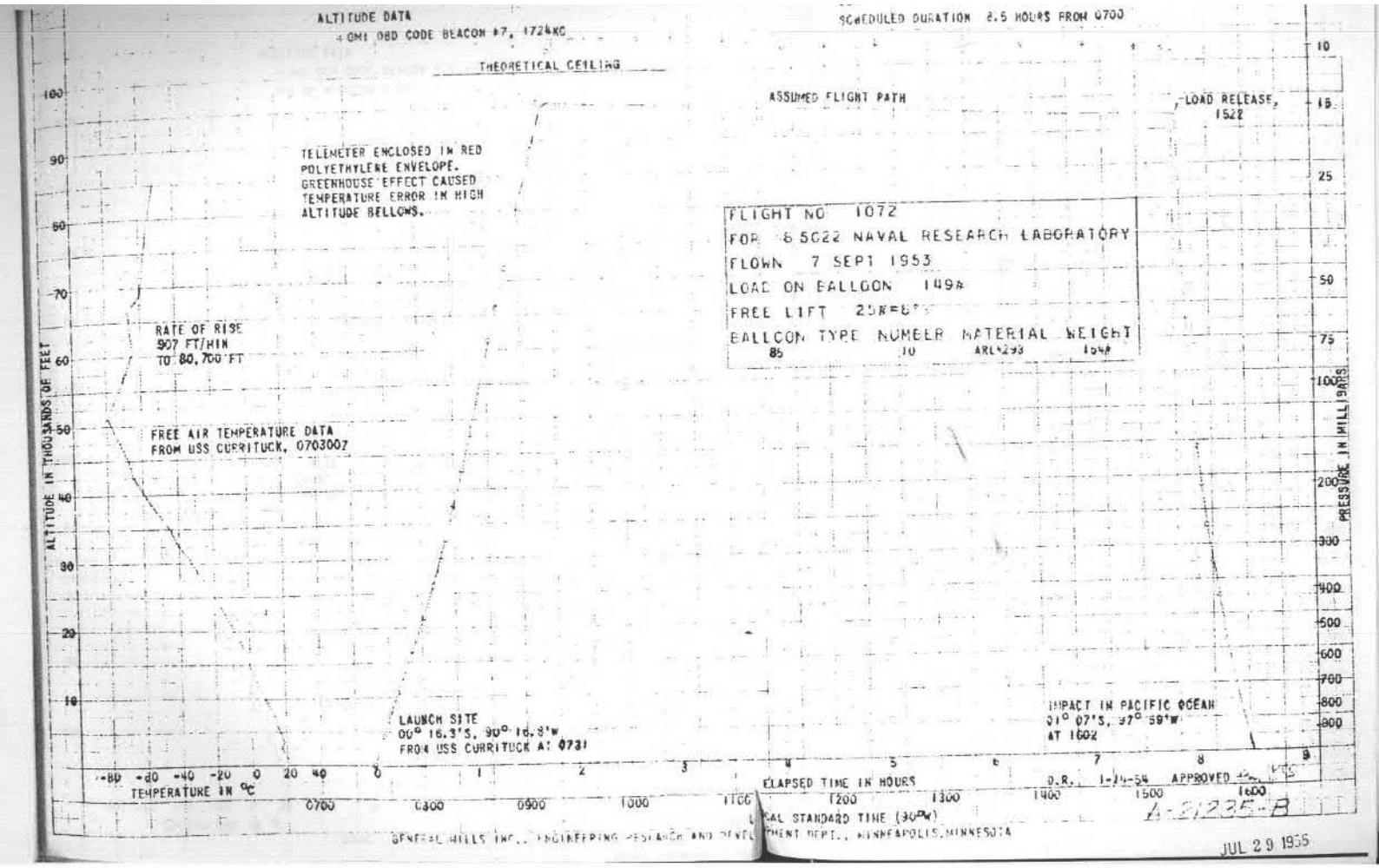
JUL 29 1955

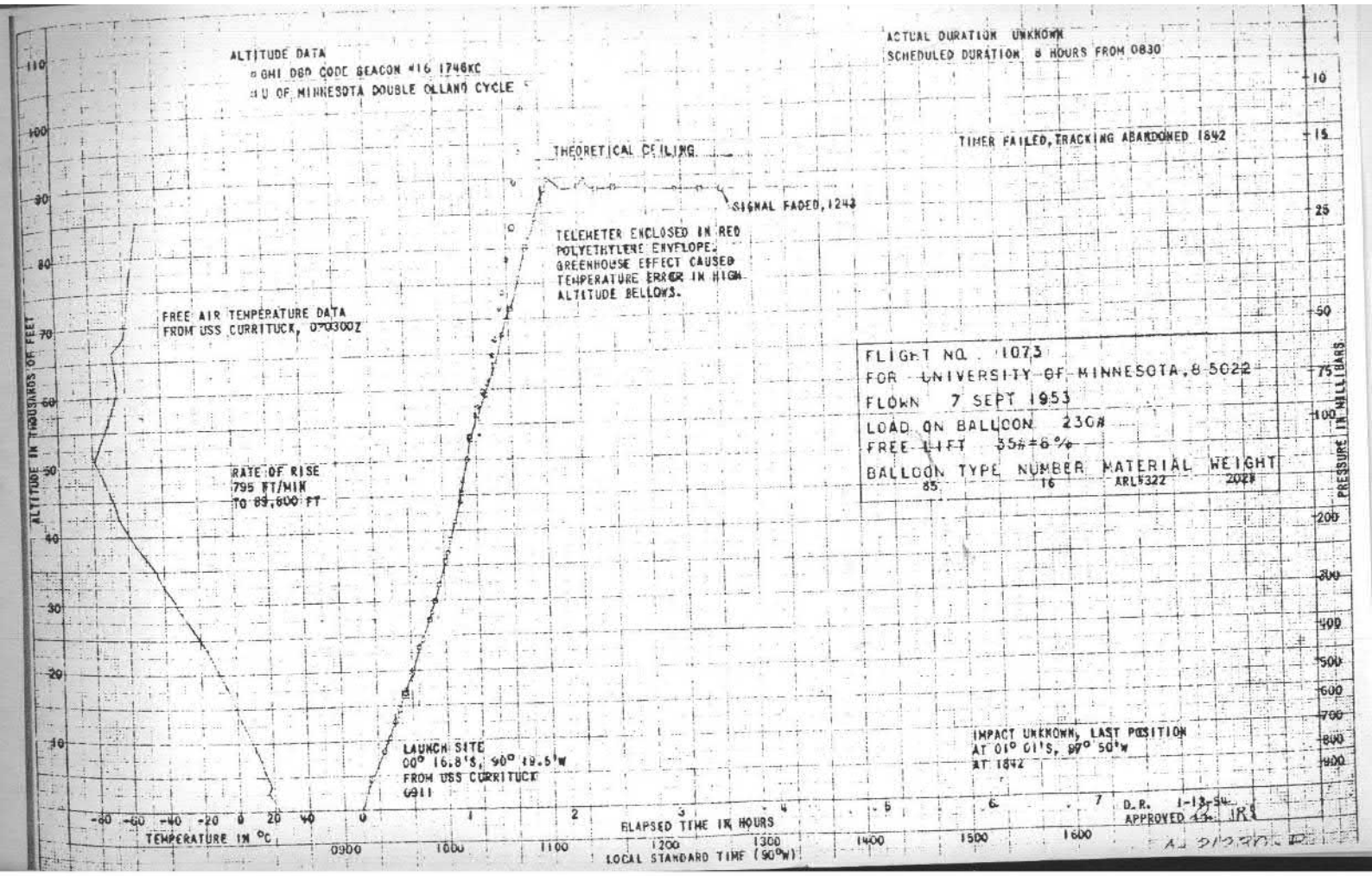


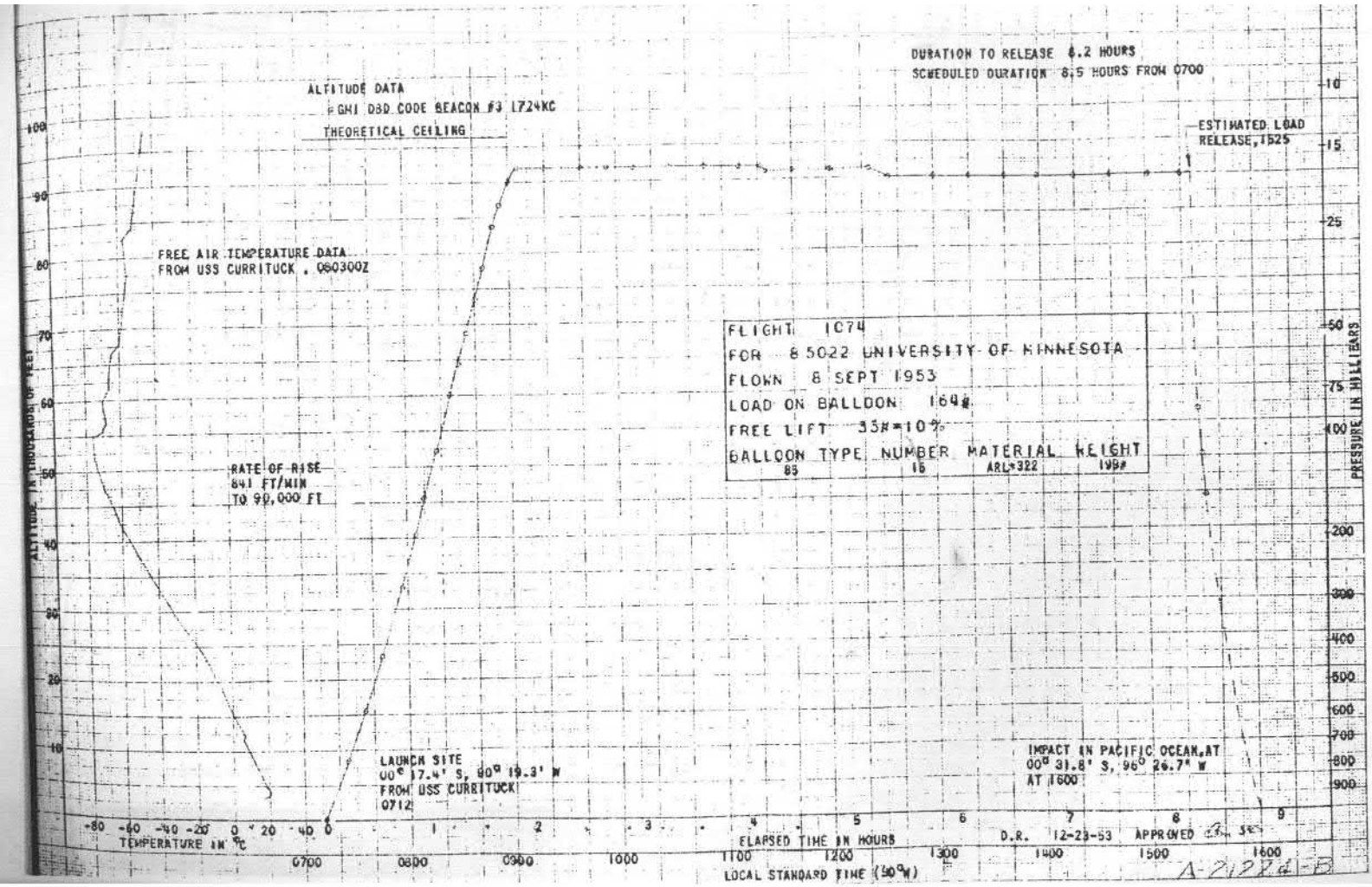
GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPARTMENT, MINNEAPOLIS, MINN.

A-21277-A

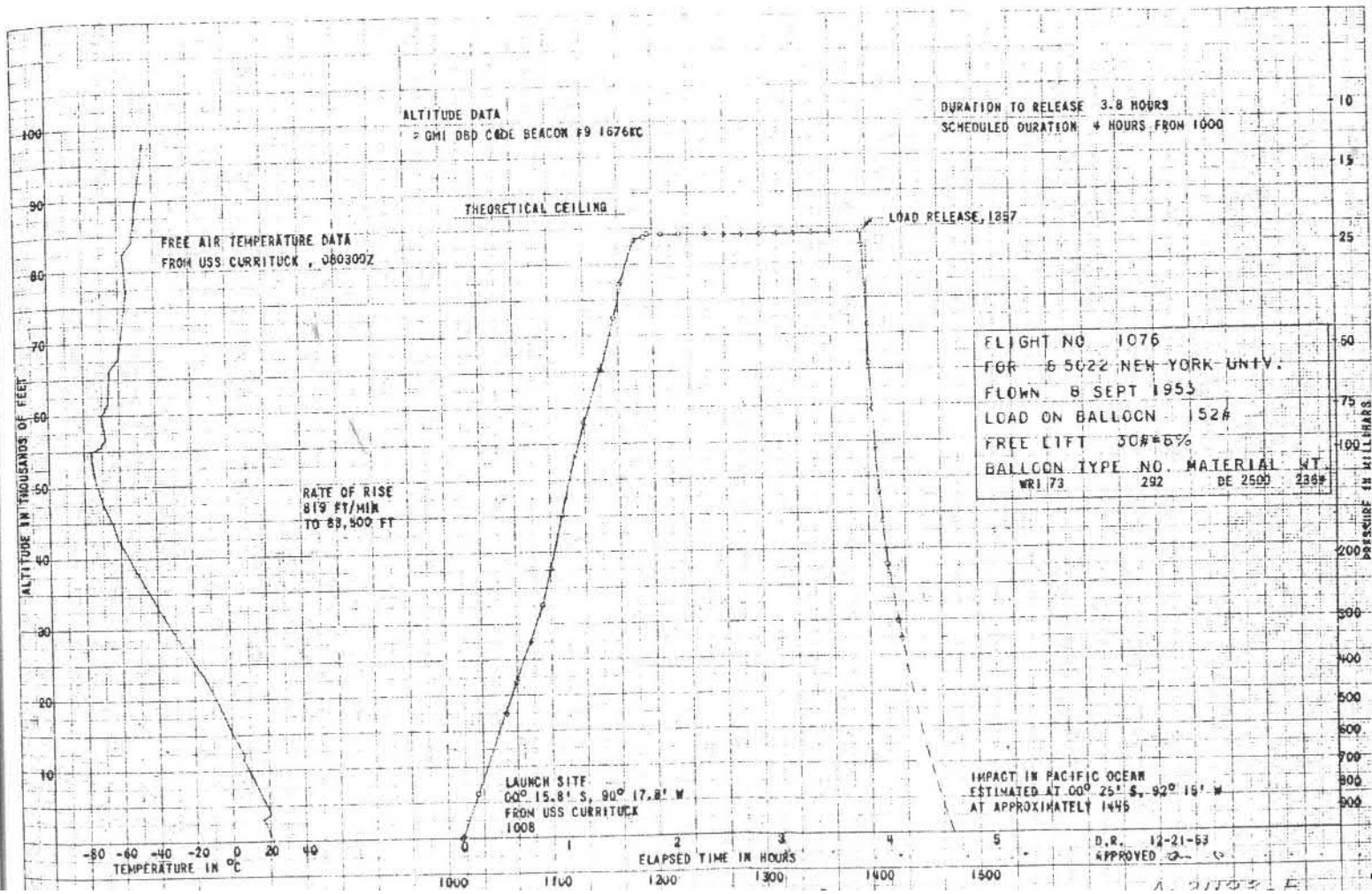
JUL 29 1955

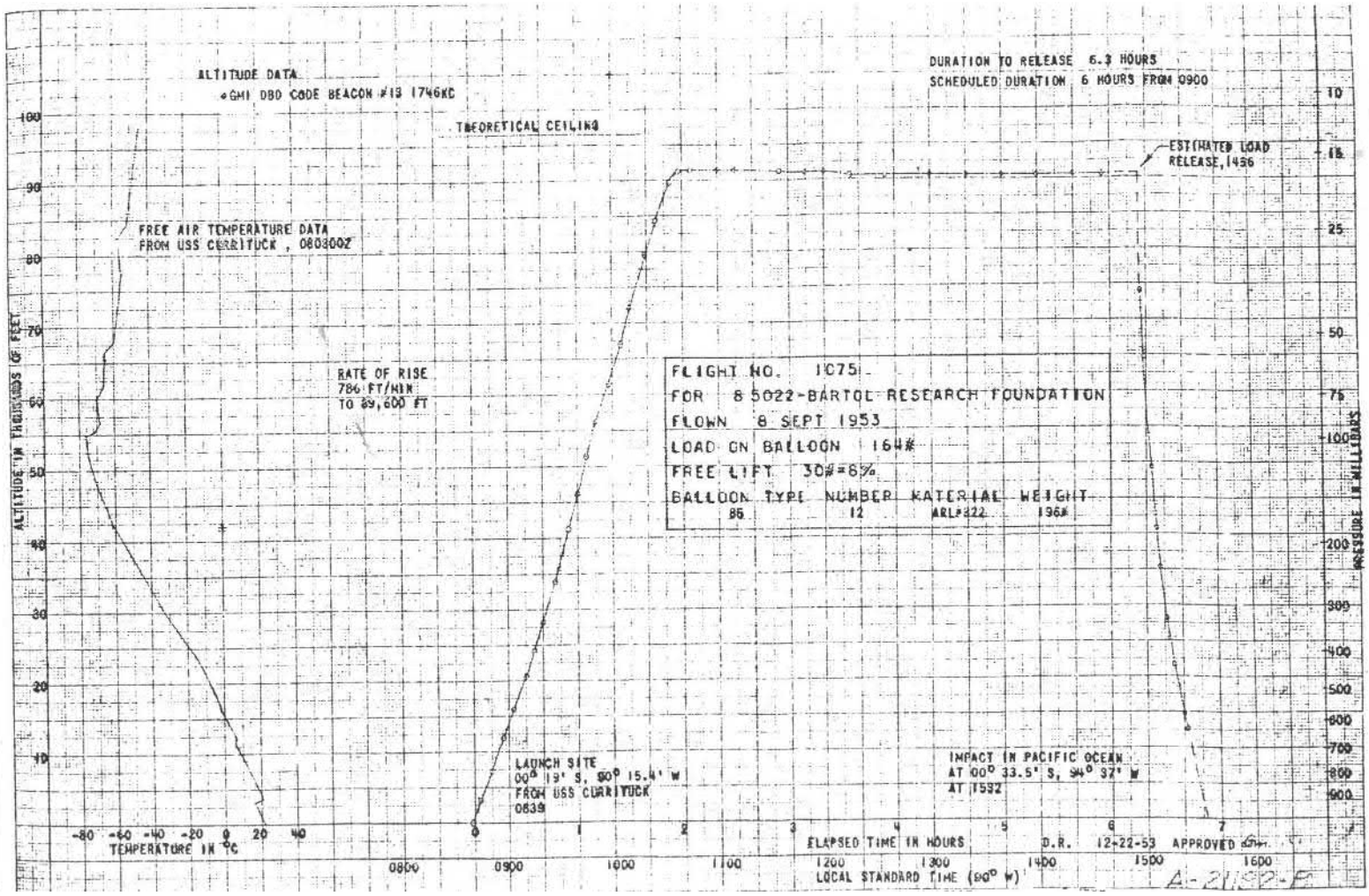

ALTITUDE DATA
+GMT DBD CODE BEACON #7, 1724KC
THEORETICAL CEILING
SCHEDULED DURATION 2.5 HOURS FROM 0700
ASSUMED FLIGHT PATH
LOAD RELEASE, 1522
TELEMETER ENCLOSED IN RED POLYETHYLENE ENVELOPE. GREENHOUSE EFFECT CAUSED TEMPERATURE ERROR IN HIGH ALTITUDE BELLOWS.
FLIGHT NO 1072
FOR 6.5022 NAVAL RESEARCH LABORATORY
FLOWN 7 SEPT 1953
LOAD ON BALLOON 149#
FREE LIFT 25#=8%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 10 ARL-293 104#
RATE OF RISE 907 FT/MIN TO 80,700 FT
FREE AIR TEMPERATURE DATA FROM USS CURRITUCK, 070300Z
LAUNCH SITE 00° 16.3'S, 90° 16.8'W FROM USS CURRITUCK AT 0731
IMPACT IN PACIFIC OCEAN 01° 07'S, 97° 59'W AT 1602
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (30°W)
D.R. 1-14-54 APPROVED
A-2125-B
JUL 29 1955
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

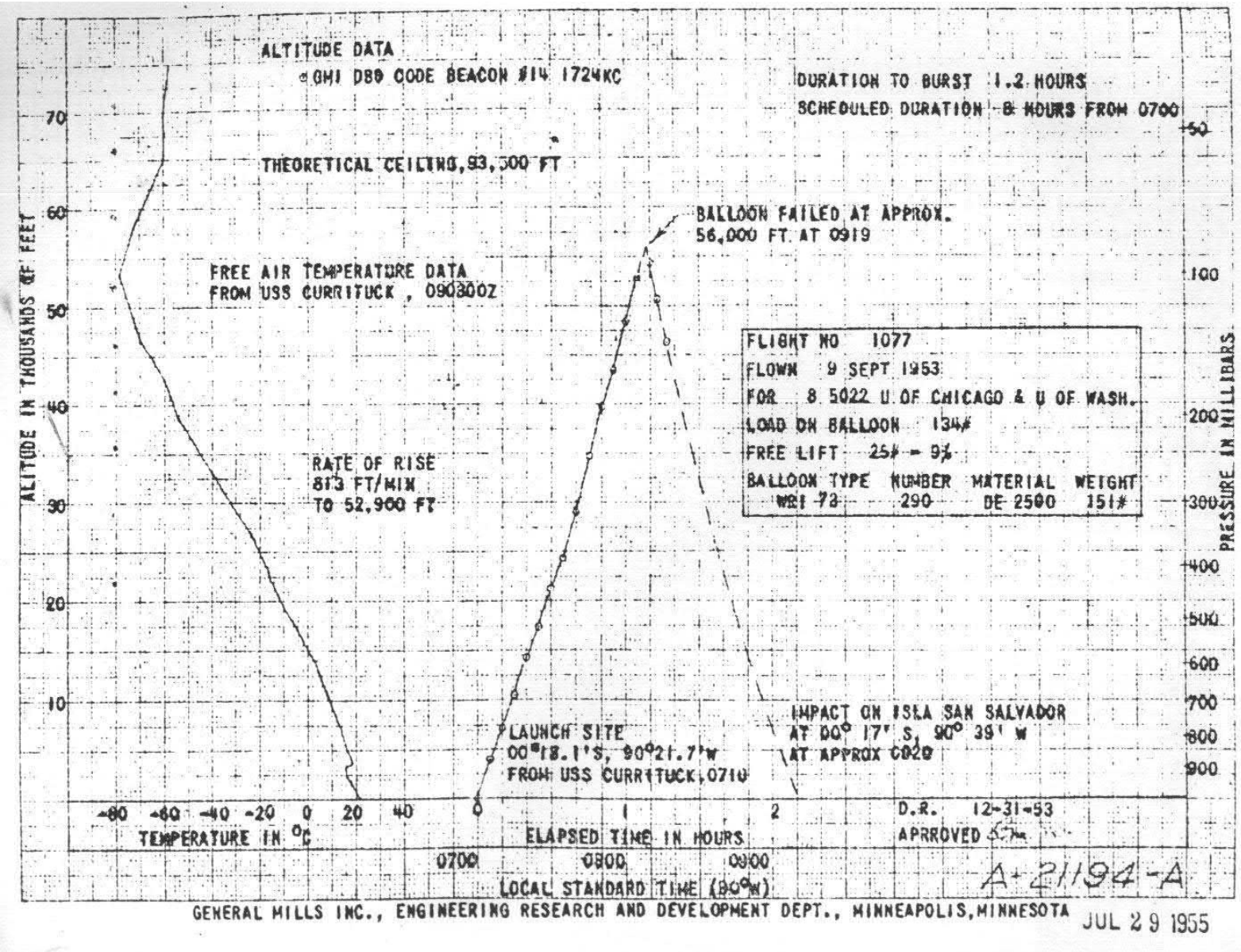

ALTITUDE DATA
GHI DBD CODE BEACON #16 1746KC
U OF MINNESOTA DOUBLE OLLAND CYCLE
ACTUAL DURATION UNKNOWN
SCHEDULED DURATION 8 HOURS FROM 0830
THEORETICAL CEILING
TIMER FAILED, TRACKING ABANDONED 1842
SIGNAL FADED, 1243
TELEMETER ENCLOSED IN RED POLYETHYLENE ENVELOPE. GREENHOUSE EFFECT CAUSED TEMPERATURE ERROR IN HIGH ALTITUDE BELLOWS.
FREE AIR TEMPERATURE DATA FROM USS CURRITUCK, 070300Z
FLIGHT NO. 1073
FOR UNIVERSITY OF MINNESOTA, S 5022
FLOWN 7 SEPT 1953
LOAD ON BALLOON 230#
FREE LIFT 35#±6%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 16 ARL#322 202#
RATE OF RISE 795 FT/MIN TO 89,600 FT
LAUNCH SITE 00° 16.8'S, 90° 18.5'W FROM USS CURRITUCK 0911
IMPACT UNKNOWN, LAST POSITION AT 01° 01'S, 99° 50'W AT 1842
D.R. 1-13-54
APPROVED
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90°W)


DURATION TO RELEASE 6.2 HOURS
SCHEDULED DURATION 8.5 HOURS FROM 0700
ALTITUDE DATA
FGHI D8D CODE BEACON #3 1724KC
THEORETICAL CEILING
ESTIMATED LOAD RELEASE, 1525
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK , 080300Z
FLIGHT 1074
FOR S 5022 UNIVERSITY OF MINNESOTA
FLOWN 8 SEPT 1953
LOAD ON BALLOON 164#
FREE LIFT 35#=10%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 16 ARL-322 198#
RATE OF RISE
841 FT/MIN
TO 90,000 FT
LAUNCH SITE
00° 17.4' S, 90° 19.3' W
FROM USS CURRITUCK
0712
IMPACT IN PACIFIC OCEAN, AT
00° 31.8' S, 96° 26.7' W
AT 1600
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90°W)
D.R. 12-23-53 APPROVED

A-2122d-B


ALTITUDE DATA
GMI DBD CODE BEACON F9 1676KC
DURATION TO RELEASE 3.8 HOURS
SCHEDULED DURATION 4 HOURS FROM 1000
THEORETICAL CEILING
LOAD RELEASE, 1357
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK , 080300Z
FLIGHT NO 1076
FOR 6.5022 NEW YORK UNIV.
FLOWN 8 SEPT 1953
LOAD ON BALLOON 152#
FREE LIFT 30#=6%
BALLOON TYPE NO. MATERIAL WT.
WRI 73 292 DE 2500 236#
RATE OF RISE
819 FT/MIN
TO 88,500 FT
LAUNCH SITE
00° 15.8' S, 90° 17.8' W
FROM USS CURRITUCK
1008
IMPACT IN PACIFIC OCEAN
ESTIMATED AT 00° 25' S, 92° 15' W
AT APPROXIMATELY 1445
ALTITUDE IN THOUSANDS OF FEET
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
PRESSURE IN MILLIBARS
D.R. 12-21-53
APPROVED

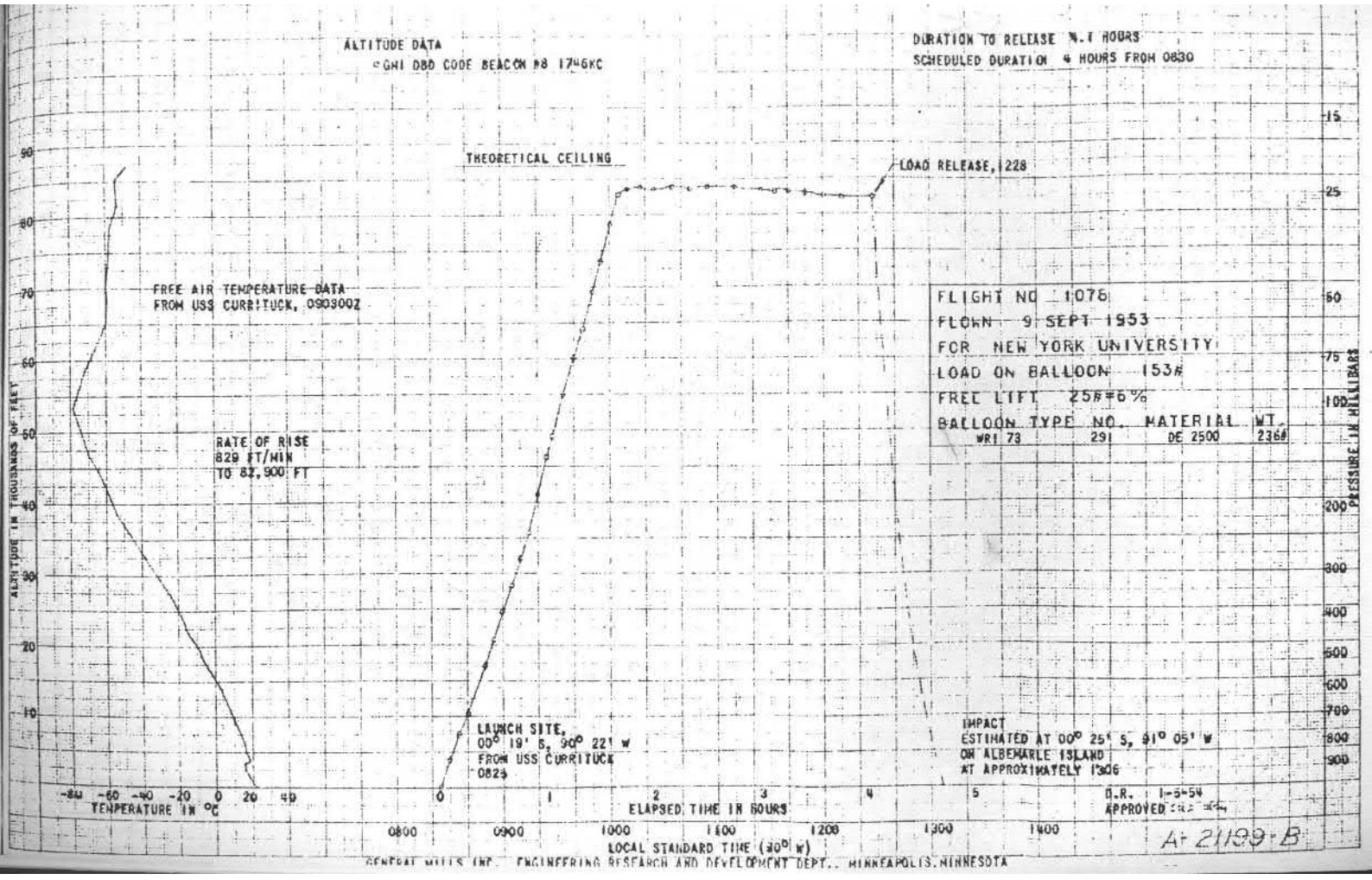

ALTITUDE DATA
GMI DBD CODE BEACON #13 1746KC
THEORETICAL CEILING
DURATION TO RELEASE 6.3 HOURS
SCHEDULED DURATION 6 HOURS FROM 0900
ESTIMATED LOAD RELEASE, 1456
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK , 0803002
RATE OF RISE
786 FT/MIN
TO 89,600 FT
FLIGHT NO. 1075
FOR S 5022-BARTOL RESEARCH FOUNDATION
FLOWN 8 SEPT 1953
LOAD ON BALLOON 164#
FREE LIFT 30#=8%
BALLOON TYPE NUMBER MATERIAL WEIGHT
86 12 ARL#422 196#
LAUNCH SITE
00° 19' S, 90° 15.4' W
FROM USS CURRITUCK
0839
IMPACT IN PACIFIC OCEAN
AT 00° 33.5' S, 94° 37' W
AT 1532
ALTITUDE IN THOUSANDS OF FEET
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90° W)
D.R. 12-22-53 APPROVED
A-2192-F

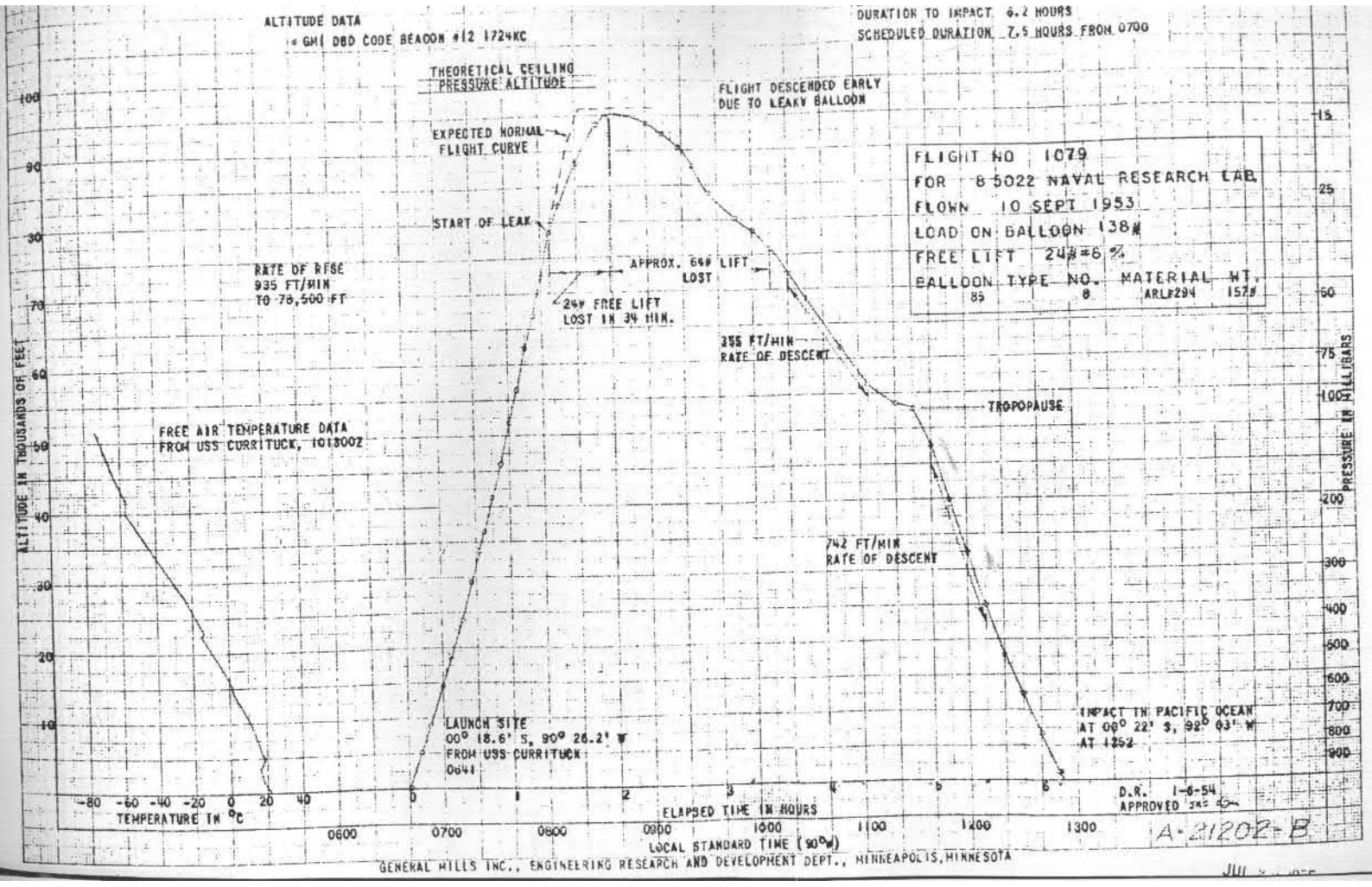


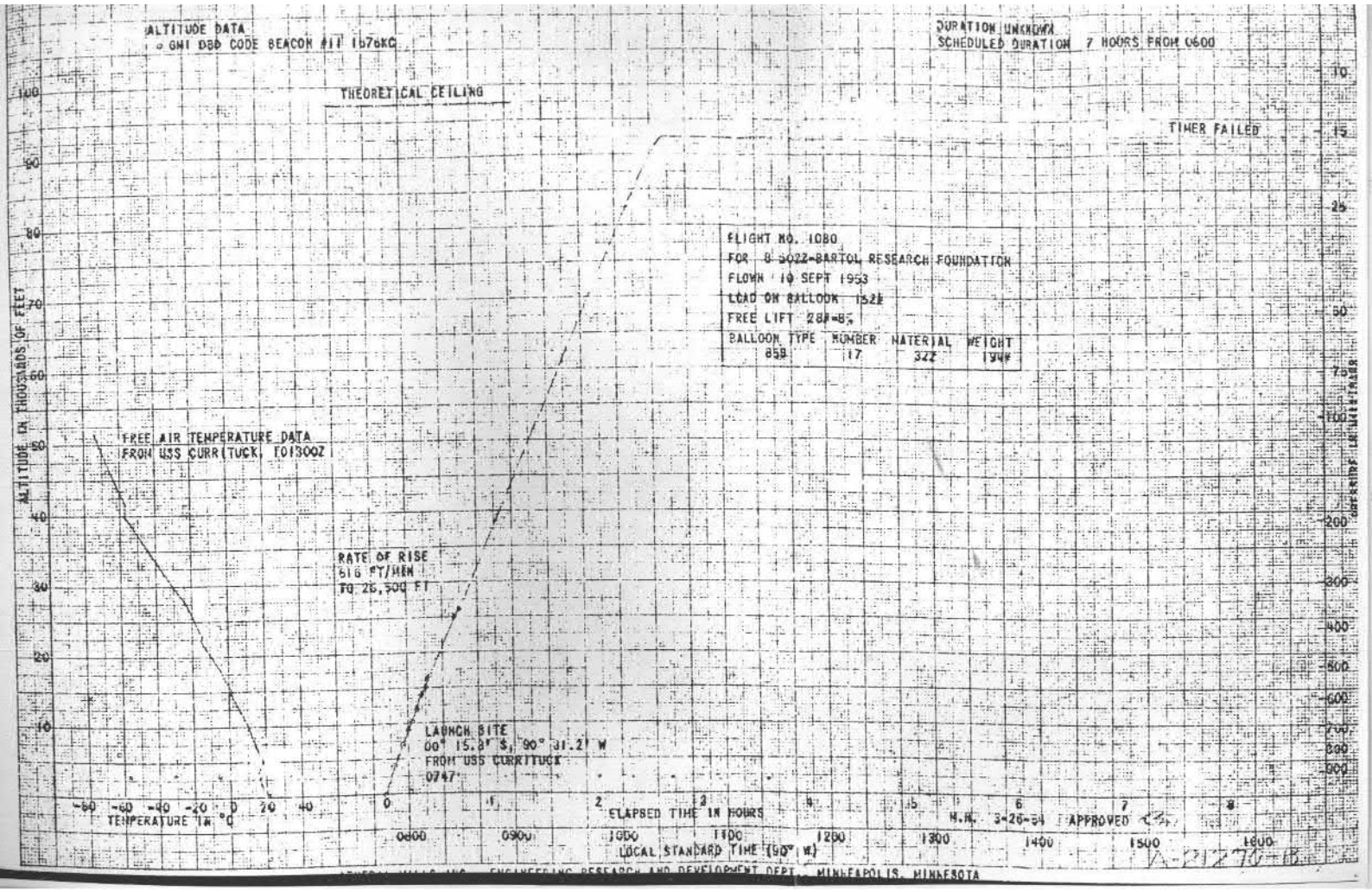
A-21194-A

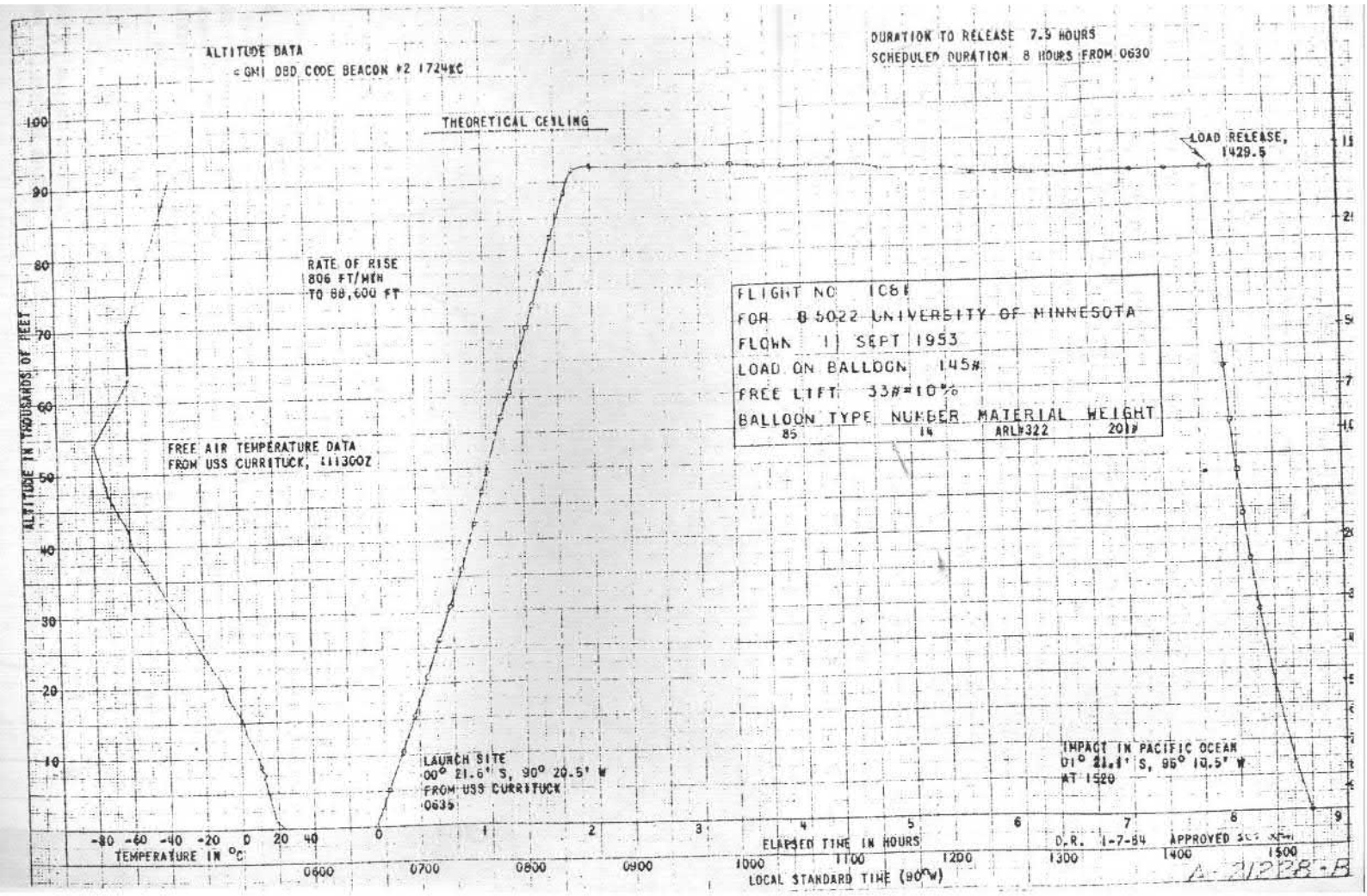
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

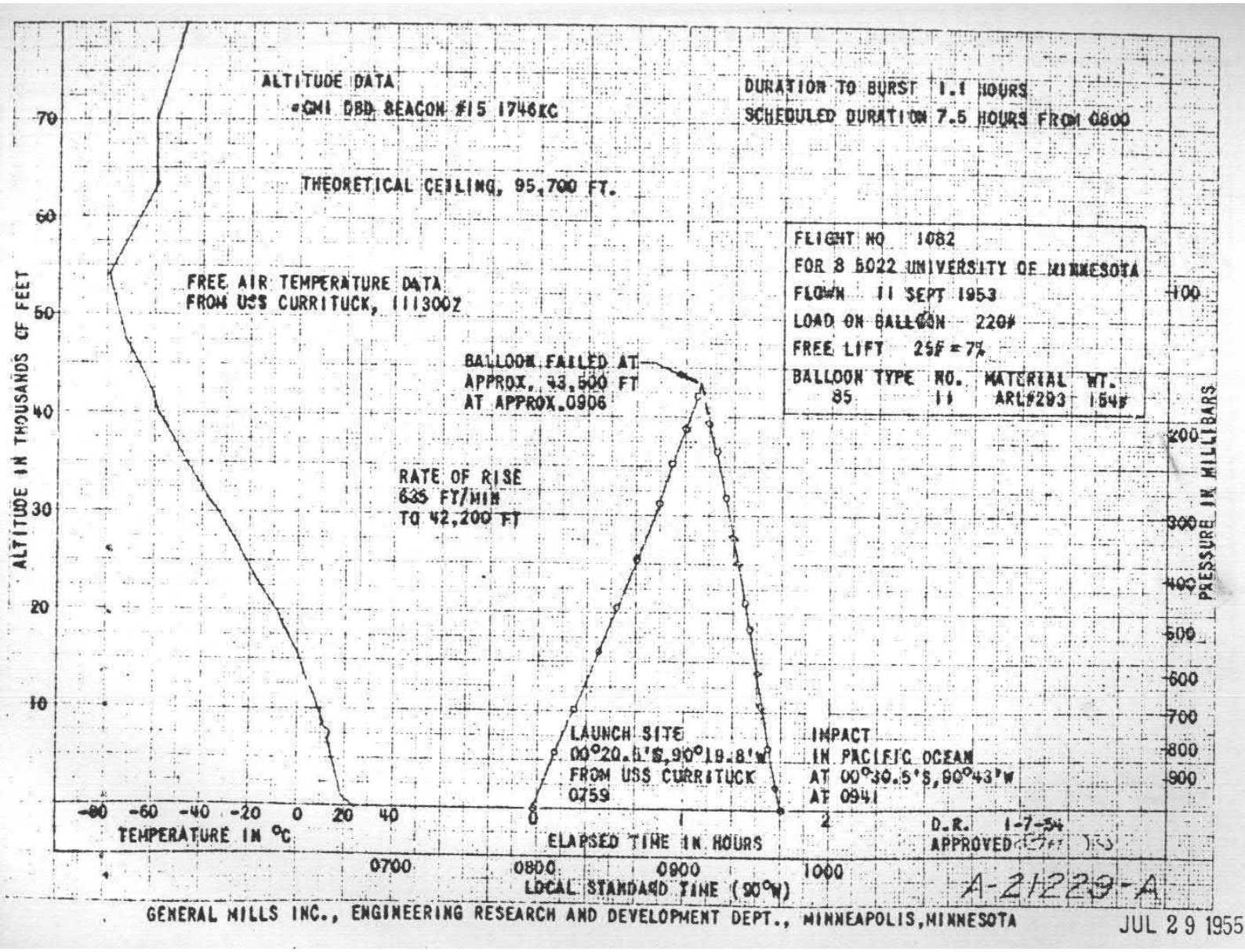
JUL 29 1955


ALTITUDE DATA
GHI DBD CODE BEACON #8 1746KC
DURATION TO RELEASE 4.1 HOURS
SCHEDULED DURATION 4 HOURS FROM 0830
THEORETICAL CEILING
LOAD RELEASE, 1228
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK, 0903002
RATE OF RISE
829 FT/MIN
TO 82,900 FT
FLIGHT NO 1076
FLOWN 9 SEPT 1953
FOR NEW YORK UNIVERSITY
LOAD ON BALLOON 153#
FREE LIFT 25#=6%
BALLOON TYPE NO. MATERIAL WT.
WRI 73 291 DE 2500 236#
LAUNCH SITE,
00° 19' S, 90° 22' W
FROM USS CURRITUCK
0824
IMPACT
ESTIMATED AT 00° 25' S, 91° 05' W
ON ALBEMARLE ISLAND
AT APPROXIMATELY 1306
ALTITUDE IN THOUSANDS OF FEET
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90° W)
PRESSURE IN MILLIBARS
D.R. 1-5-54
APPROVED
A-21199-B
GENERAL MILLS INC. ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA


ALTITUDE DATA
GMI DBD CODE BEACON #12 1724KC
DURATION TO IMPACT 6.2 HOURS
SCHEDULED DURATION 7.5 HOURS FROM 0700
THEORETICAL CEILING PRESSURE ALTITUDE
FLIGHT DESCENDED EARLY DUE TO LEAKY BALLOON
EXPECTED NORMAL FLIGHT CURVE
START OF LEAK
RATE OF RISE 935 FT/MIN TO 78,500 FT
APPROX. 64# LIFT LOST
24# FREE LIFT LOST IN 34 MIN.
355 FT/MIN RATE OF DESCENT
TROPOPAUSE
742 FT/MIN RATE OF DESCENT
FREE AIR TEMPERATURE DATA FROM USS CURRITUCK, 101800Z
FLIGHT NO 1079
FOR S 5022 NAVAL RESEARCH LAB.
FLOWN 10 SEPT 1953
LOAD ON BALLOON 138#
FREE LIFT 24#=6 %
BALLOON TYPE NO. MATERIAL WT.
85 8 ARL-294 157#
LAUNCH SITE 00° 18.6' S, 90° 26.2' W FROM USS CURRITUCK 0641
IMPACT IN PACIFIC OCEAN AT 08° 22' S, 92° 03' W AT 1252
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90°W)
D.R. 1-6-54
APPROVED
A-21202-B
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

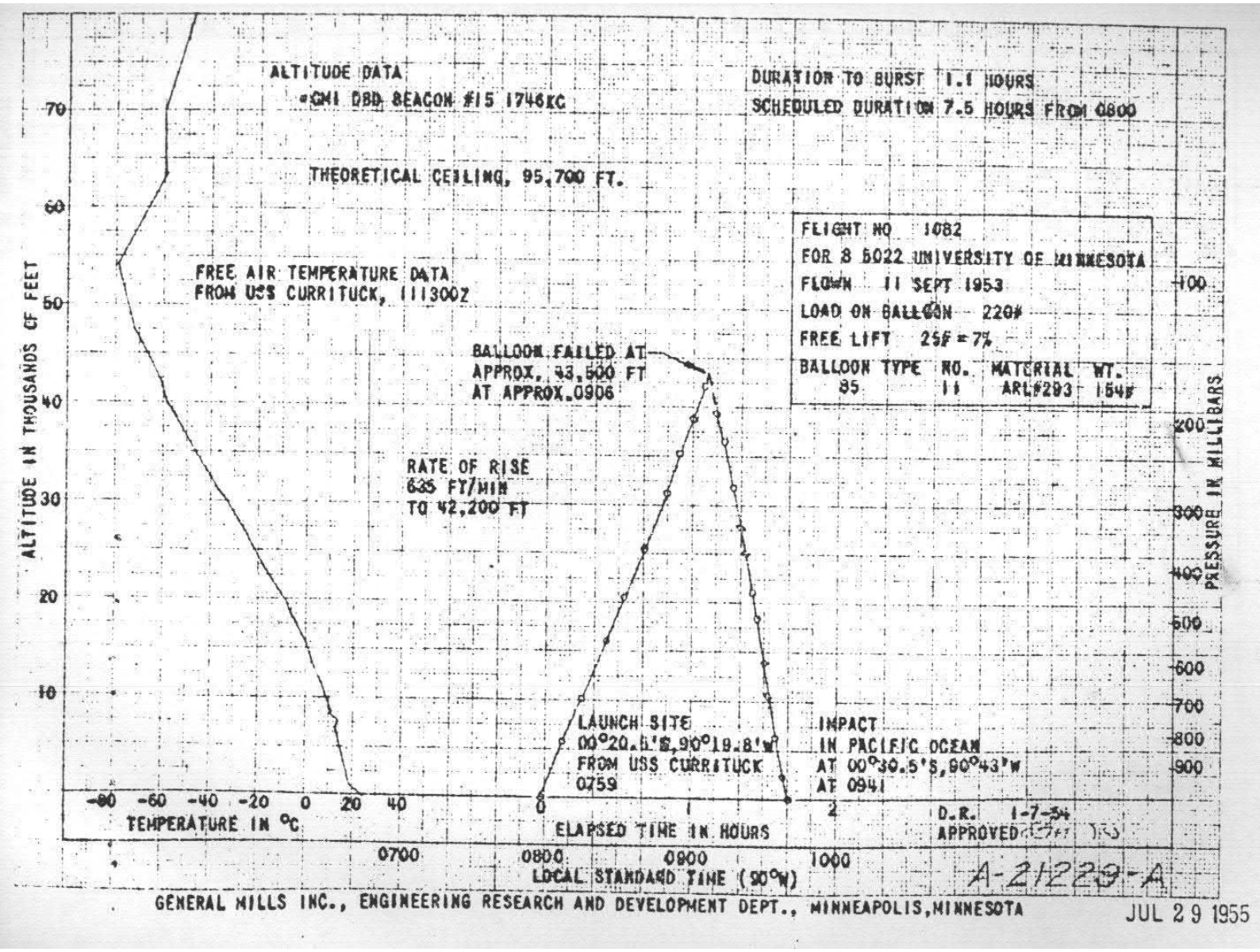

ALTITUDE DATA
GMI DBD CODE BEACON #17 1676KC
DURATION UNKNOWN
SCHEDULED DURATION 7 HOURS FROM 0600
THEORETICAL CEILING
TIMER FAILED
FLIGHT NO. 1080
FOR S. SOZZ-BARTOL RESEARCH FOUNDATION
FLOWN 10 SEPT 1953
LOAD ON BALLOON 152#
FREE LIFT 28#=8%
BALLOON TYPE NUMBER MATERIAL WEIGHT
859 17 32Z 1700#
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK, 0130OZ
RATE OF RISE
616 FT/MIN
TO 26,500 FT
LAUNCH SITE
00° 15.3' S, 90° 31.2' W
FROM USS CURRITUCK
0747
ALTITUDE IN THOUSANDS OF FEET
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90° W.)
M.M. 3-26-54 APPROVED
ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

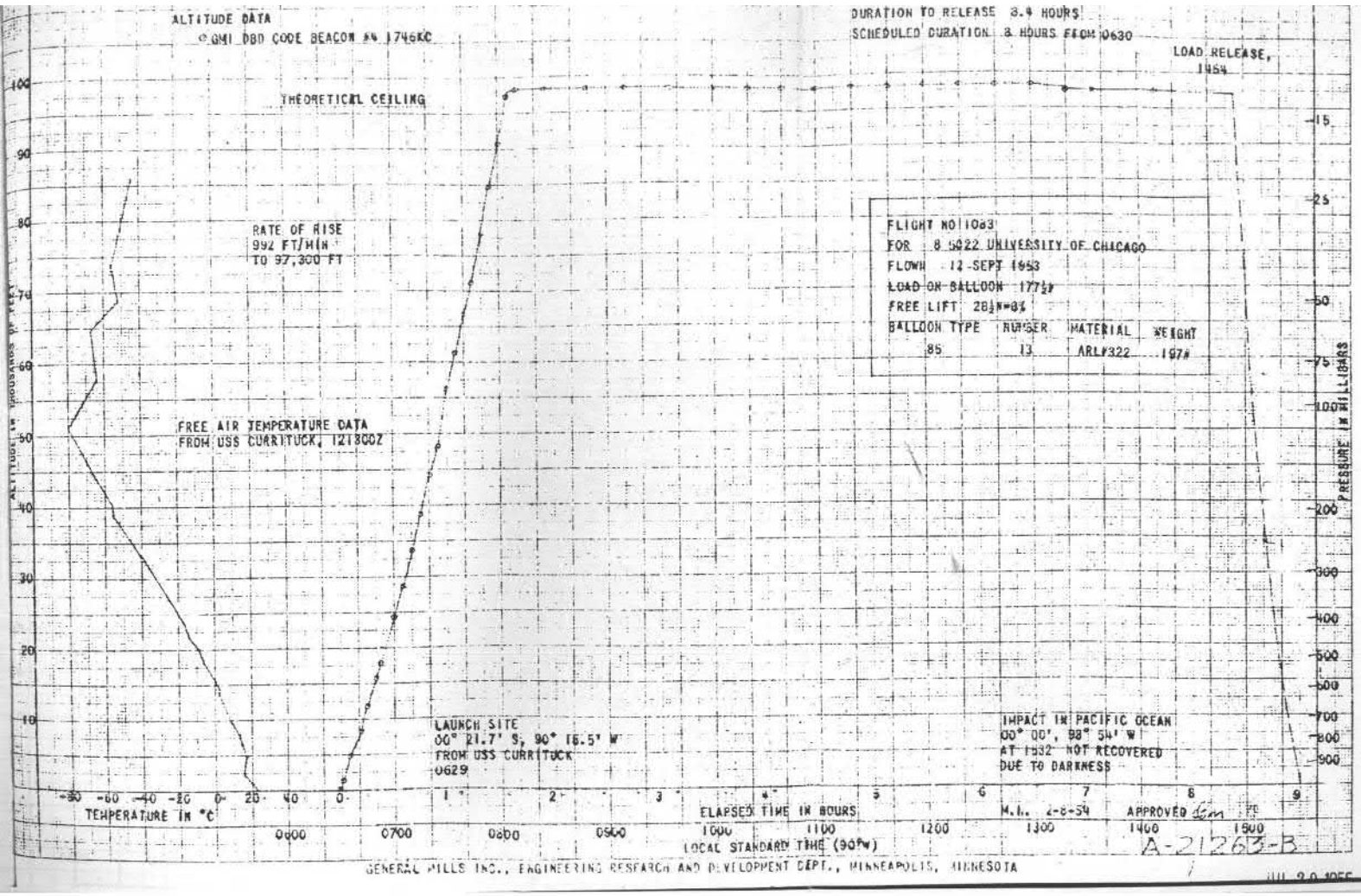

ALTITUDE DATA
GMI OBD CODE BEACON #2 1724KC
DURATION TO RELEASE 7.5 HOURS
SCHEDULED DURATION 8 HOURS FROM 0630
THEORETICAL CEILING
LOAD RELEASE, 1429.5
RATE OF RISE 806 FT/MIN TO 88,600 FT
FLIGHT NO 1C6E
FOR B 5022 UNIVERSITY OF MINNESOTA
FLOWN 11 SEPT 1953
LOAD ON BALLOON 145#
FREE LIFT 33#=10%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 14 ARL#322 201#
FREE AIR TEMPERATURE DATA FROM USS CURRITUCK, 1113GOZ
LAUNCH SITE 00° 21.6' S, 90° 20.5' W FROM USS CURRITUCK 0635
IMPACT IN PACIFIC OCEAN 01° 21.1' S, 95° 10.5' W AT 1520
ALTITUDE IN THOUSANDS OF FEET
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90°W)
D.R. 1-7-54 APPROVED
A-31228-B



GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

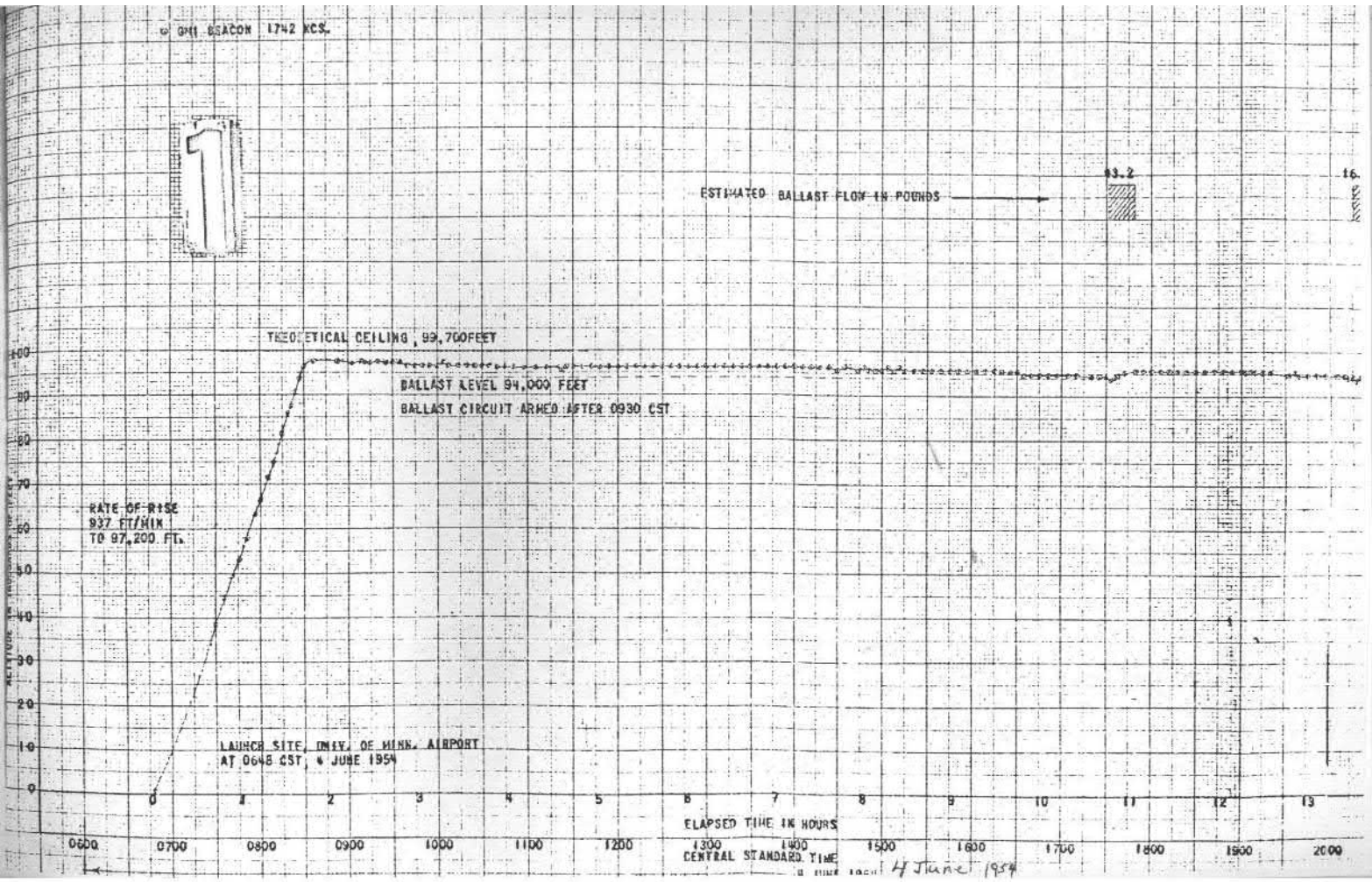
JUL 29 1955

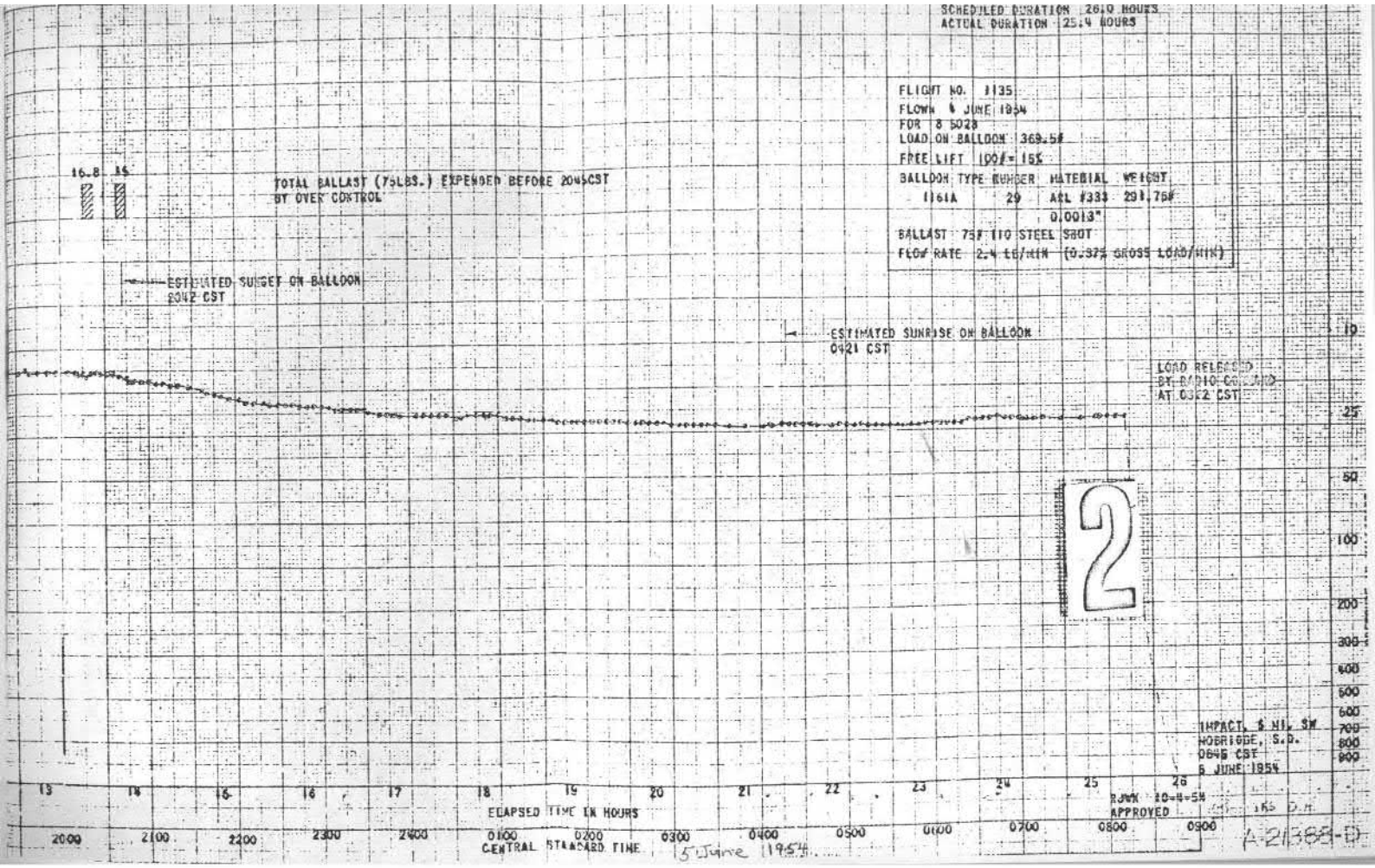

ALTITUDE DATA
GMI DBD BEACON #15 1746KC
DURATION TO BURST 1.1 HOURS
SCHEDULED DURATION 7.5 HOURS FROM 0800
THEORETICAL CEILING, 95,700 FT.
FREE AIR TEMPERATURE DATA
FROM USS CURRITUCK, 111300Z
FLIGHT NO 1082
FOR S 5022 UNIVERSITY OF MINNESOTA
FLOWN 11 SEPT 1953
LOAD ON BALLOON 220#
FREE LIFT 25# = 7%
BALLOON TYPE NO. MATERIAL WT.
85 11 ARL#293 154#
BALLOON FAILED AT
APPROX. 93,500 FT
AT APPROX.0906
RATE OF RISE
635 FT/MIN
TO 42,200 FT
LAUNCH SITE
00°20.5'S,90°19.8'W
FROM USS CURRITUCK
0759
IMPACT
IN PACIFIC OCEAN
AT 00°30.5'S,90°43'W
AT 0941
D.R. 1-7-54
APPROVED
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
TEMPERATURE IN °C
ELAPSED TIME IN HOURS
LOCAL STANDARD TIME (90°W)
A-21229-A
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA
JUL 29 1955

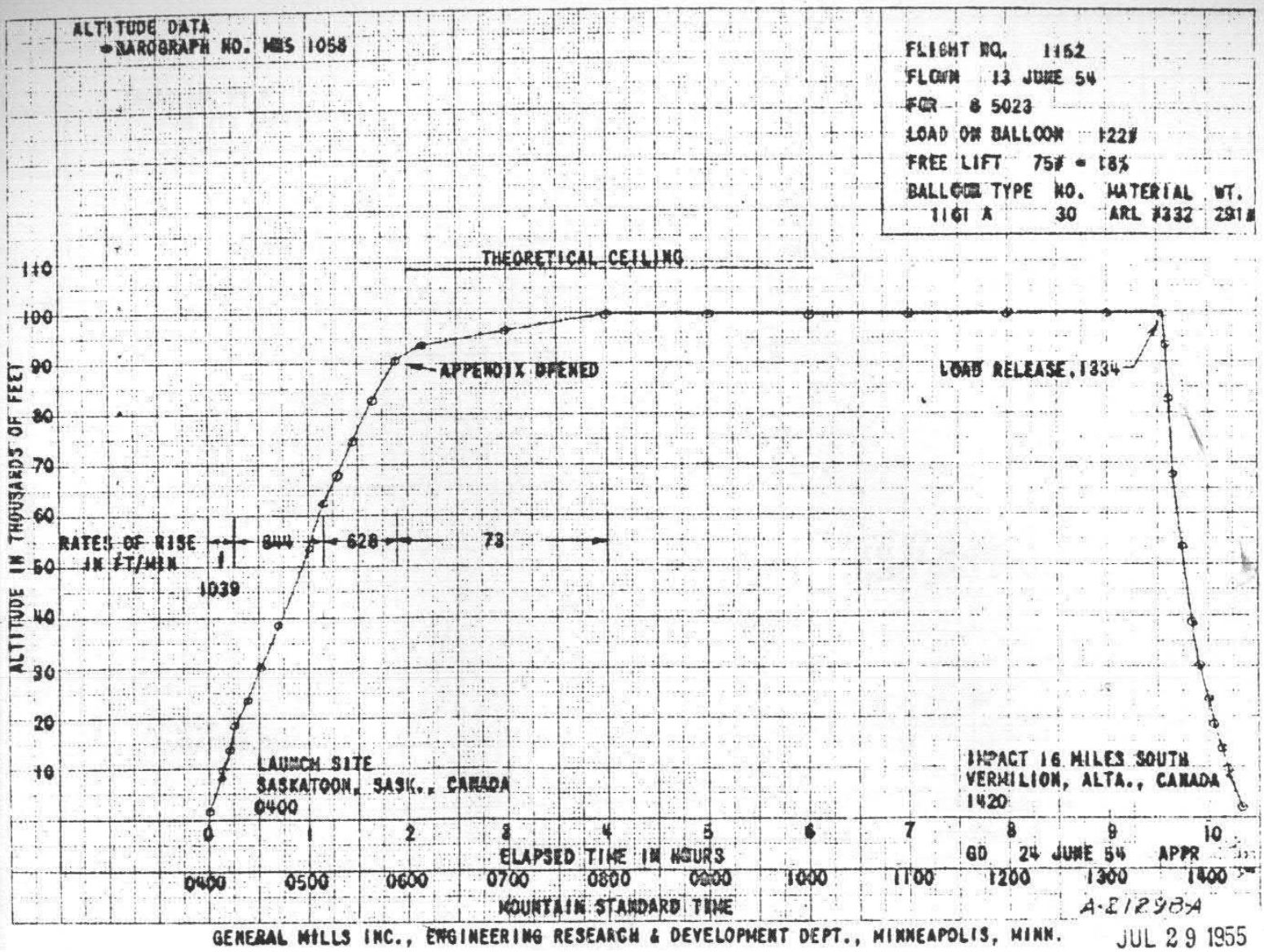


GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

A-21263-B

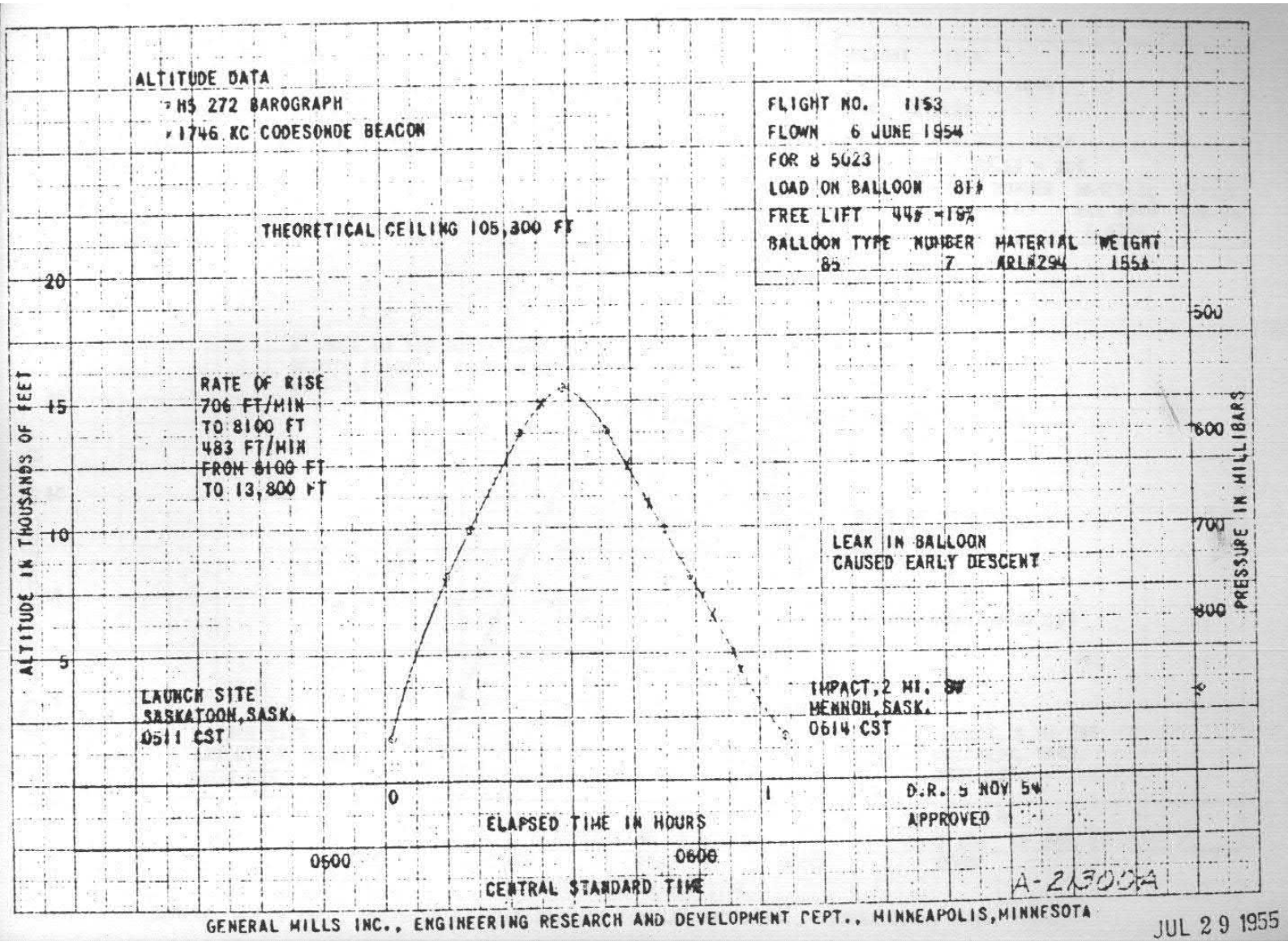

9 GM1 BEACON 1742 KCS.
1
ESTIMATED BALLAST FLOW IN POUNDS
43.2
16.
THEORETICAL CEILING, 99,700 FEET
BALLAST LEVEL 94,000 FEET
BALLAST CIRCUIT ARMED AFTER 0930 CST
RATE OF RISE
937 FT/MIN
TO 97,200 FT.
LAUNCH SITE, UNIV. OF MINN. AIRPORT
AT 0648 CST, 4 JUNE 1954
ALTITUDE IN THOUSANDS OF FEET
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5 6 7 8 9 10 11 12 13
ELAPSED TIME IN HOURS
0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
CENTRAL STANDARD TIME
4 June 1954


SCHEDULED DURATION 2610 HOURS
ACTUAL DURATION 25:4 HOURS
FLIGHT NO. 3135
FLOWN 6 JUNE 1954
FOR S SOZA
LOAD ON BALLOON 369.5#
FREE LIFT 100# = 15%
BALLOON TYPE NUMBER MATERIAL WEIGHT
1161A 29 AEL #333 291.75#
0.0013"
BALLAST 75# 110 STEEL SHOT
FLOW RATE 2.4 LB/MIN (0.32% GROSS LOAD/MIN)
16.8 15
TOTAL BALLAST (75LBS.) EXPENDED BEFORE 2045CST
BY OVER CONTROL
ESTIMATED SUNSET ON BALLOON
2042 CST
ESTIMATED SUNRISE ON BALLOON
0421 CST
LOAD RELEASED
BY RADIO COMMAND
AT 0352 CST
2
IMPACT, S NI, SW
HOBBS, N.M.
0845 CST
6 JUNE 1954
RANK 30-4-54
APPROVED
13 14 15 16 17 18 19 20 21 22 23 24 25 26
ELAPSED TIME IN HOURS
2000 2100 2200 2300 2400 0100 0200 0300 0400 0500 0600 0700 0800 0900
CENTRAL STANDARD TIME
5 June 1954
10 25 50 100 200 300 400 500 600 700 800 900



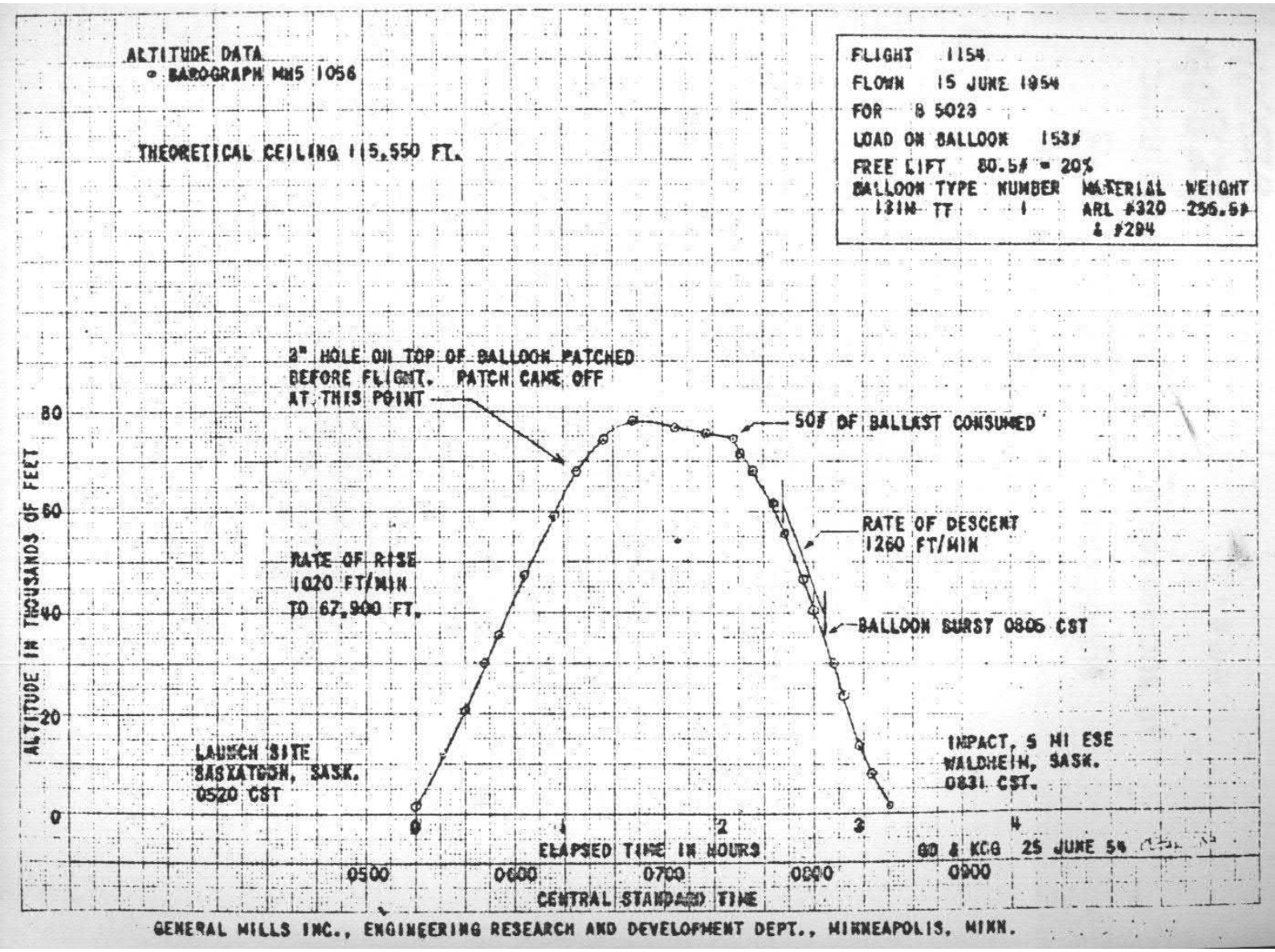
GENERAL MILLS INC., ENGINEERING RESEARCH & DEVELOPMENT DEPT., MINNEAPOLIS, MINN.

JUL 29 1955

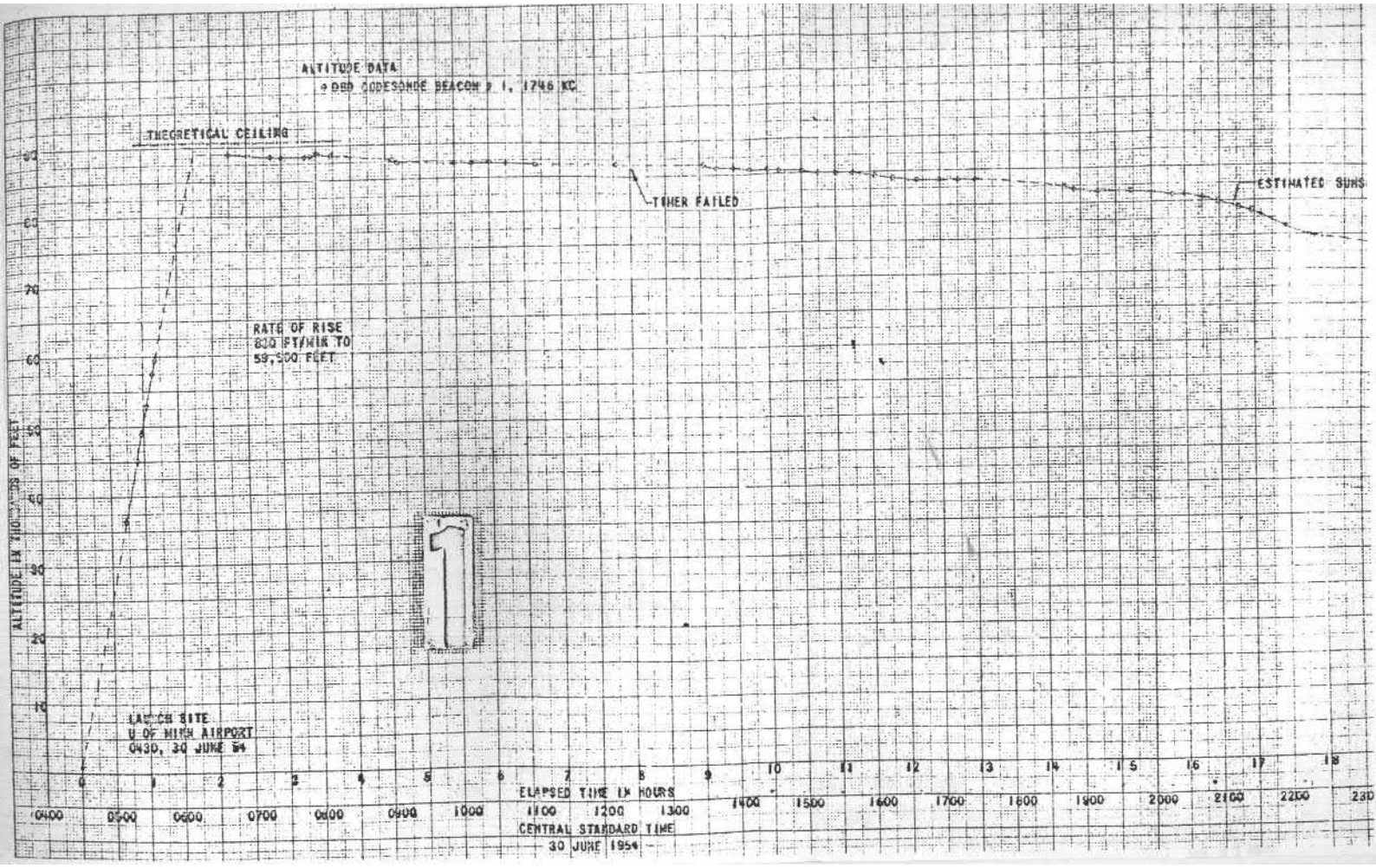


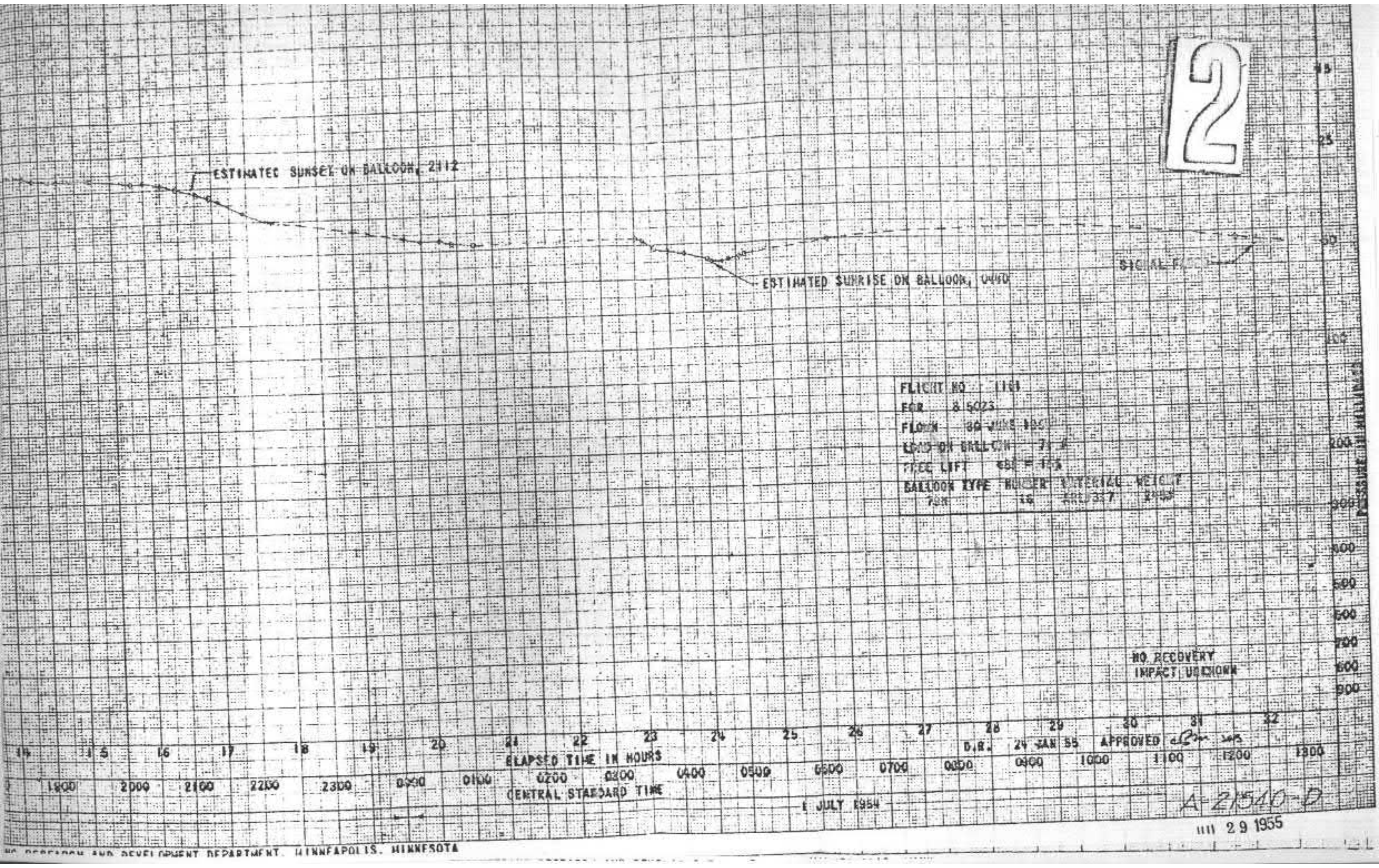
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA

JUL 29 1955

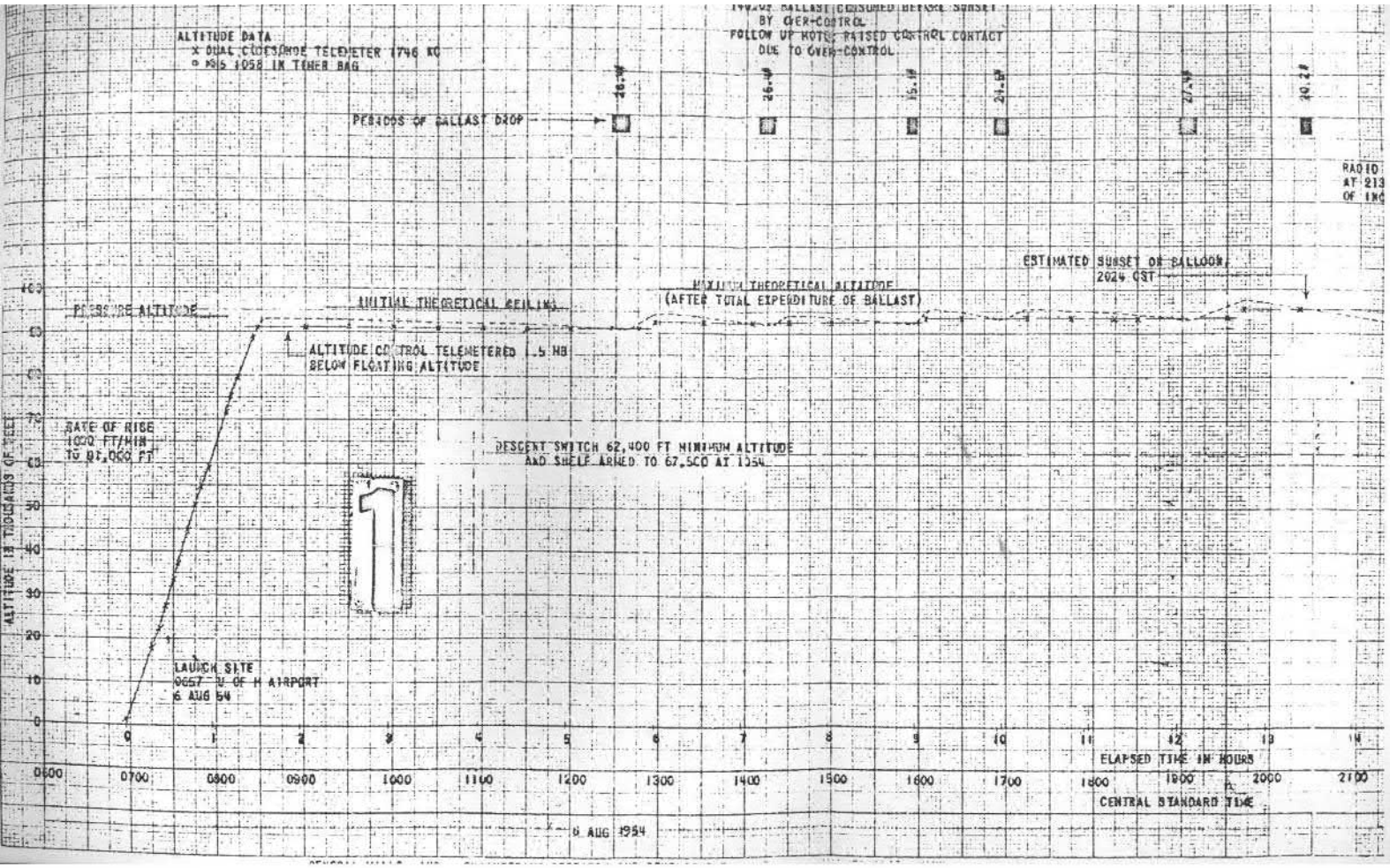


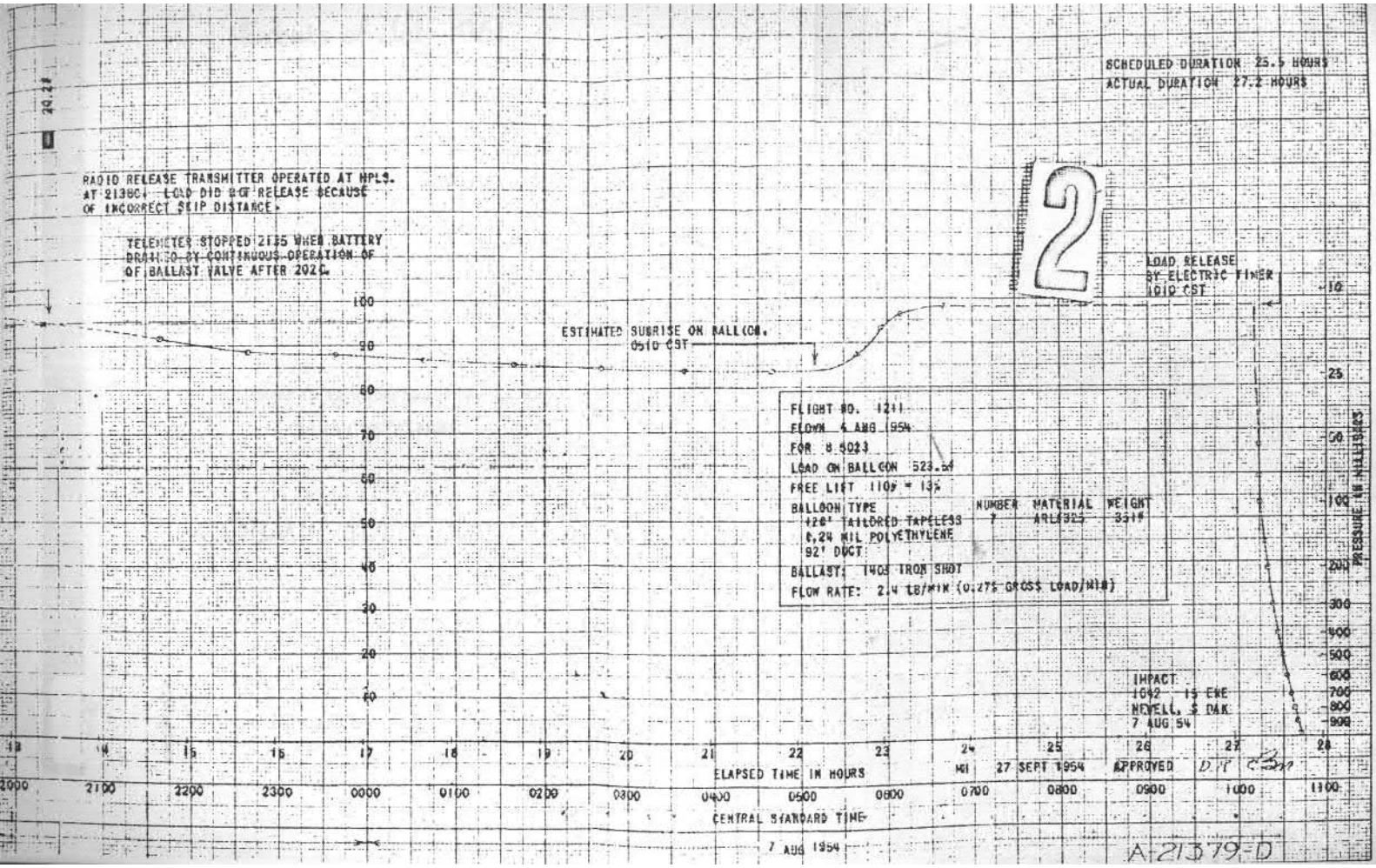
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.


ALTITUDE DATA
DBD RADIOSONDE BEACON # 1, 1746 KC
THEORETICAL CEILING
TETHER FAILED
ESTIMATED SUNS
RATE OF RISE
800 FT/MIN TO
59,500 FEET
1
LAUNCH SITE
U OF MICH AIRPORT
0430, 30 JUNE 54
ALTITUDE IN HUNDREDS OF FEET
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
30 JUNE 1954



2
ESTIMATED SUNSET ON BALLOON, 2112
ESTIMATED SUNRISE ON BALLOON, 0440
SIGNAL FADED
FLIGHT NO 1161
FOR 8 5023
FLOWN 30 JUNE 1954
LOAD ON BALLOON 71 #
FREE LIFT 458 = 15%
BALLOON TYPE NUMBER MATERIAL WEIGHT
NO RECOVERY
IMPACT UNKNOWN
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
1 JULY 1954
D.R. 24 JAN 55 APPROVED
A-21540-D
29 1955
RESEARCH AND DEVELOPMENT DEPARTMENT, MINNEAPOLIS, MINNESOTA


ALTITUDE DATA
x DUAL CLOSE MODE TELEMETER 1746 KC
o MSS 1058 IN TIMER BAG
BY OVER-CONTROL
FOLLOW UP NOTE: RAISED CONTROL CONTACT
DUE TO OVER-CONTROL
PERIODS OF BALLAST DROP
26.4#
26.4#
15.1#
24.6#
27.4#
30.2#
RADIO
AT 213
OF INC
ESTIMATED SUNSET OR BALLOON
2024 CST
MAXIMUM THEORETICAL ALTITUDE
(AFTER TOTAL EXPENDITURE OF BALLAST)
INITIAL THEORETICAL CEILING
PRESSURE ALTITUDE
ALTITUDE CONTROL TELEMETERED 1.5 MB
BELOW FLOATING ALTITUDE
RATE OF RISE
1000 FT/MIN
TO 85,000 FT
DESCENT SWITCH 62,400 FT MINIMUM ALTITUDE
AND SHELF ARMED TO 67,500 AT 1554
1
LAUNCH SITE
OGST U OF H AIRPORT
6 AUG 54
ALTITUDE IN THOUSANDS OF FEET
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
6 AUG 1954


SCHEDULED DURATION 25.5 HOURS
ACTUAL DURATION 27.2 HOURS
RADIO RELEASE TRANSMITTER OPERATED AT MPLS. AT 2138C. LOAD DID NOT RELEASE BECAUSE OF INCORRECT SKIP DISTANCE.
TELEMETER STOPPED 2135 WHEN BATTERY DRAINED BY CONTINUOUS OPERATION OF BALLAST VALVE AFTER 2020.
2
LOAD RELEASE BY ELECTRIC TIMER 1010 CST
ESTIMATED SUNRISE ON BALLOON 0510 CST
FLIGHT NO. 1211
FLOWN 4 AUG 1954
FOR U.S.D.A.
LOAD ON BALLOON 523.0#
FREE LIFT 110# = 13%
BALLOON TYPE NUMBER MATERIAL WEIGHT
128' TAILORED TAPELESS 1 ARL#325 331#
0.24 MIL POLYETHYLENE
92' DUCT
BALLAST: 140# IRON SHOT
FLOW RATE: 2.4 LB/MIN (0.275 GROSS LOAD/MIN)
IMPACT
1042 15 ENE
NEWELL, S DAK
7 AUG 54
PRESSURE IN MILLIBARS
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
7 AUG 1954
27 SEPT 1954 APPROVED
A-21579-D